

AD-A070 620

D'APPOLONIA CONSULTING ENGINEERS INC PITTSBURGH PA
NATIONAL DAM INSPECTION PROGRAM. PA-484 DAM (NDI-ID-PA-489) (DE--ETC(U)
MAR 79

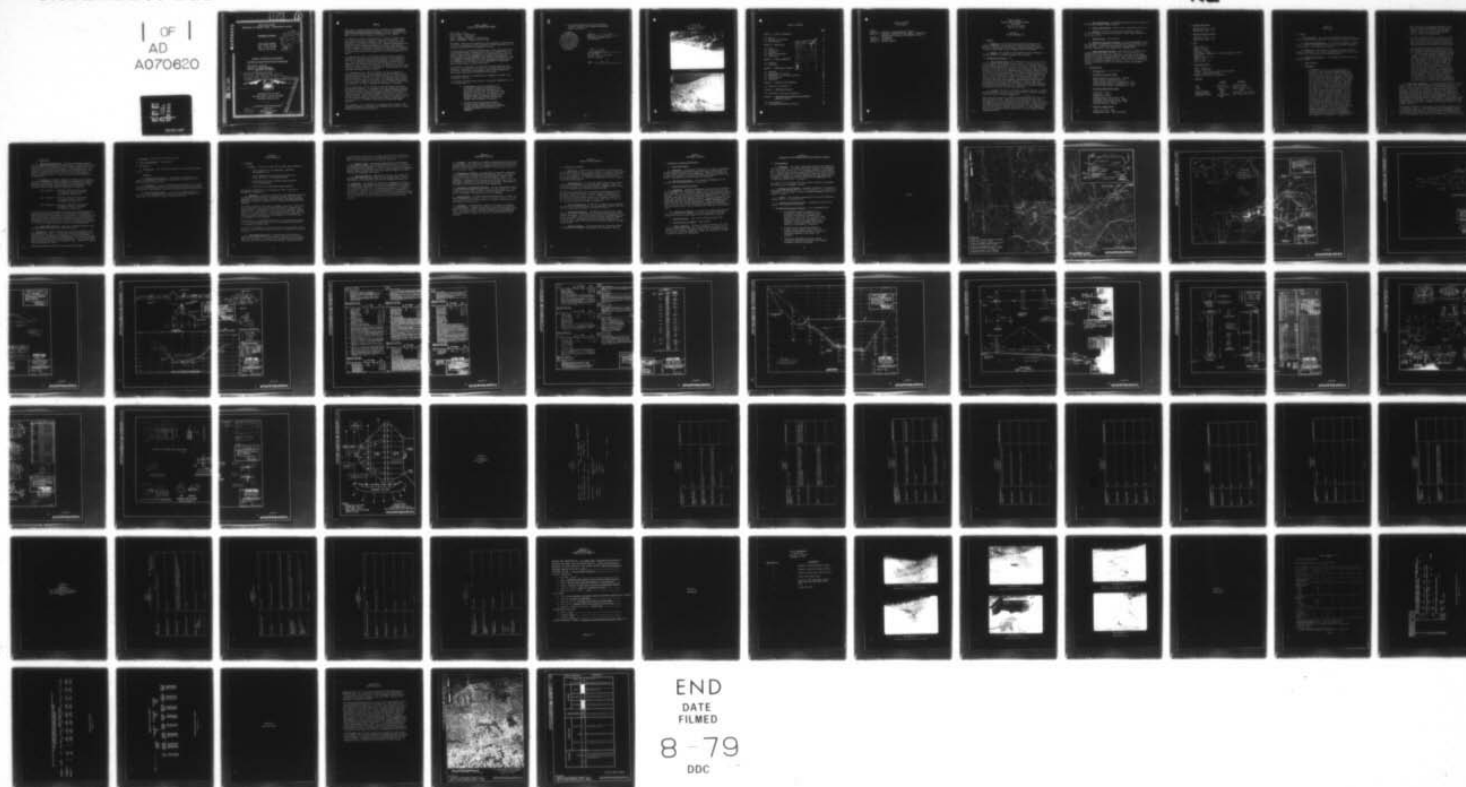
F/G 13/2

DACW31-79-C-0014

NL

UNCLASSIFIED

| OF |
AD
A070620



END
DATE
FILMED

8-79

DDC



NATIONAL BUREAU OF STANDARDS
MICROCOPY RESOLUTION TEST CHART

ADA 070620

DDC FILE COPY

LEVEL

1 B.S.

OHIO RIVER BASIN
TRIBUTARY OF HARMON CREEK , WASHINGTON COUNTY

PENNSYLVANIA

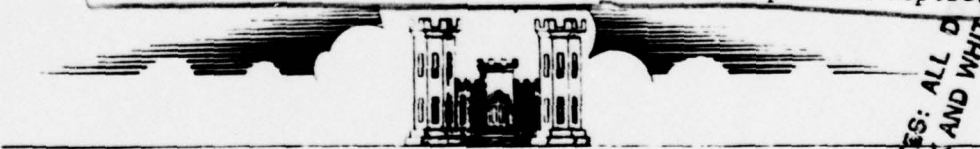
PA-484 DAM
NDI I.D. NO: PA-489
DER I.D. NO: 63-72



PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

Distribution Unlimited
Approved for Public Release
Contract No. DACW31-79-C-0014

6 National Dam Inspection Program.
PA-484 Dam (NDI-ID-PA-489) (DER ID-63-72)
Ohio River Basin, Tributary of Harmon Creek,
Washington County, Pennsylvania. Phase I Inspection Report.



PREPARED FOR

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS
BALTIMORE, MARYLAND 21203

BY

D'APPOLONIA CONSULTING ENGINEERS
10 DUFF ROAD
PITTSBURGH, PA. 15235

12 74p.

11 MARCH 1979

ORIGINAL CONTAINS COLOR PLATES: ALL D
REPRODUCTIONS WILL BE IN BLACK AND WHITE
411 001

79 06 28 066

mt

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Department of the Army, Office of Chief of Engineers, Washington, D.C. 20314.

The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon visual observations and review of available data. Detailed investigation and analyses involving topographic mapping, subsurface investigations, material testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the inspection is intended to identify any need for such studies which should be performed by the owner.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of the dam depends on numerous and constantly changing internal and external factors which are evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The assessment of the conditions and recommendations was made by the consulting engineer in accordance with generally and currently accepted engineering principles and practices.

PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

NAME OF DAM: PA-484
STATE LOCATED: Pennsylvania
COUNTY LOCATED: Washington
STREAM: Unnamed tributary of Harmon Creek
DATE OF INSPECTION: December 5 and 20, 1978

ASSESSMENT: Based on the evaluation of the conditions as they existed on the dates of inspection and as revealed by visual observations, the condition of PA-484 dam is considered to be fair.

A swampy area with associated seepage exists on the lower one-third of the downstream slope. Although at this time this condition does not appear to pose instability problems, a concern exists as to the continued integrity of the embankment under maximum pool conditions. It is therefore considered advisable that necessary instrumentation, such as piezometers, be installed to monitor the phreatic surface through the embankment and the stability of the embankment be reevaluated based on the results of these observations.

On the dates of inspection, the pool was at primary spillway crest elevation, indicating that the orifice on the drop inlet structure is obstructed. Subsequent correspondence from the Soil Conservation Service indicated that this obstruction was removed.

The spillway capacity is classified to be adequate according to the recommended criteria.

The following recommendations should be implemented immediately or on a continuing basis.

1. The embankment should be evaluated by a professional engineer experienced in earth dam design and necessary instrumentation installed to monitor the wet area on the downstream slope of the dam. The stability of the embankment should be evaluated based on the results of these observations and necessary remedial work performed, if required.
2. Around-the-clock surveillance should be provided during unusually heavy runoff and a formal warning system developed to alert the downstream residents in the event of an emergency.

3. The dam and appurtenant structures should be inspected regularly and necessary maintenance should be performed.



Lawrence D. Andersen

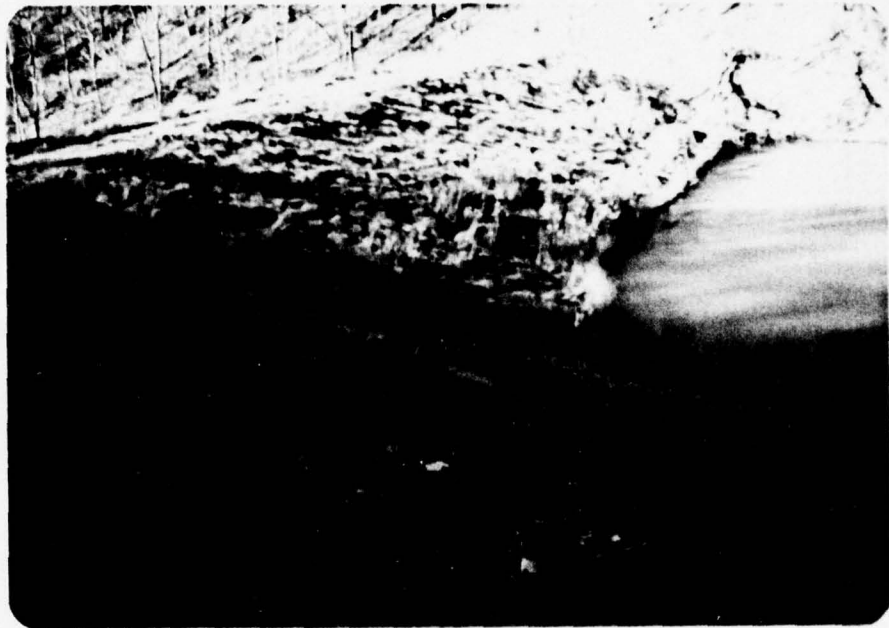
Lawrence D. Andersen, P.E.
Vice President

G. K. Withers

G. K. WITHERS
Colonel, Corps of Engineers
District Engineer

DATE: 22 Apr 79

PA-484 DAM
NDI I.D. NO. PA-489
DECEMBER 5, 1978



Upstream Face



Downstream Face

TABLE OF CONTENTS

	<u>PAGE</u>
SECTION 1 - PROJECT INFORMATION	1
1.1 General	1
1.2 Description of Project	1
1.3 Pertinent Data	2
SECTION 2 - DESIGN DATA	
2.1 Design	4
2.2 Construction	4
2.3 Operation	6
2.4 Other Investigations	7
2.5 Evaluation	7
SECTION 3 - VISUAL INSPECTION	
3.1 Findings	8
3.2 Evaluation	9
SECTION 4 - OPERATIONAL FEATURES	
4.1 Procedure	10
4.2 Maintenance of the Dam	10
4.3 Maintenance of Operating Facilities	10
4.4 Warning System	10
4.5 Evaluation	10
SECTION 5 - HYDRAULICS AND HYDROLOGY	11
5.1 Evaluation of Features	11
SECTION 6 - STRUCTURAL STABILITY	12
6.1 Evaluation of Structural Stability	12
SECTION 7 - ASSESSMENT AND RECOMMENDATIONS/PROPOSED REMEDIAL MEASURES	13
7.1 Dam Assessment	13
7.2 Recommendations/Remedial Measures	13

Accession For	
NTIS GRA&I	<input checked="checked" type="checkbox"/>
DDC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By _____	
Distribution/	
Availability Codes	
Dist	Available/or special
A	

TABLE OF CONTENTS
(Continued)

PLATES

- APPENDIX A - CHECKLIST, VISUAL INSPECTION, PHASE I
- APPENDIX B - CHECKLIST, ENGINEERING DATA, DESIGN, CONSTRUCTION,
OPERATION AND HYDROLOGIC AND HYDRAULIC, PHASE I
- APPENDIX C - PHOTOGRAPHS
- APPENDIX D - CALCULATIONS
- APPENDIX E - REGIONAL GEOLOGY

PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM
PA-484 DAM
NDI I.D. NO. PA-489
DER I.D. NO. 63-72

SECTION 1
PROJECT INFORMATION

1.1 General

a. Authority. The inspection was performed pursuant to the authority granted by The National Dam Inspection Act, Public Law 92-367, to the Secretary of the Army, through the Corps of Engineers, to conduct inspections of dams throughout the United States.

b. Purpose. The purpose of this inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project

a. Dam and Appurtenances. The PA-484 Dam is one of the 14 flood control projects in the Harmon Creek watershed. The dam consists of an earth embankment approximately 320 feet long, with a maximum height of 67 feet from the downstream toe and a crest width of 14 feet. The flood discharge facilities for the dam consist of a drop inlet primary spillway located at the center of the embankment and an emergency spillway on the left abutment (looking downstream). The primary spillway structures consist of a two-stage reinforced concrete riser, a 24-inch-diameter reinforced concrete conduit and a reinforced concrete impact basin at the downstream end of the outlet conduit. The emergency spillway is a 50-foot-wide trapezoidal earth channel excavated into the left abutment. The reservoir outlet for the dam consists of a 12-inch steel pipe extending from the upstream toe of the dam to the drop inlet structure. Flow through the reservoir outlet is controlled by a manually operated sluice gate located in the drop inlet structure.

b. Location. The dam is located on an unnamed tributary of Harmon Creek approximately one mile west of Hanlon Station in Hanover Township, Washington County, Pennsylvania (Plate 1).

Downstream from the dam, the stream flows approximately 1000 feet south and joins Harmon Creek. There are no structures within this reach. Approximately 1-1/2 miles downstream of the confluence, there are about 20 residences within the flood plain of Harmon Creek. Further downstream, the Harmon Creek flows through the town of Collier, West Virginia, and joins the Ohio River at Weirton, West Virginia. It is estimated that failure of the dam would cause large loss of life and property damage along Harmon Creek.

c. Size Classification. Intermediate (Based on 67-foot height and 119 acre-feet maximum storage capacity.)

d. Hazard Classification. High (Based on downstream conditions.)

e. Ownership. County of Washington, Pennsylvania (address: Mr. Joseph Giecek, Administrative Assistant, Court House, Washington, Pennsylvania 15301).

f. Purpose of Dam. Flood control.

g. Design and Construction History. The dam was designed by the U.S. Department of Agriculture, Soil Conservation Service (SCS), during 1967 and 1968. The dam was constructed by Louis McMasters, Inc., of McMurray, Pennsylvania, with completion in September 1971.

h. Normal Operating Procedure. The reservoir is normally maintained at Elevation 919.3, the crest level of an orifice on the upstream face of the drop inlet structure. The crest of the primary spillway is located at Elevation 938.25, and the crest of the emergency spillway is located at Elevation 947.0. Under normal flow conditions, inflow is discharged through the orifice. Flood flows are discharged through the primary spillway or in conjunction with the emergency spillway.

1.3 Pertinent Data.

a. Drainage Area - 0.6 square miles

b. Discharge at Dam Site (cfs)

Maximum known flood at dam site - Unknown
Outlet conduit at maximum pool - 125
Gated spillway capacity at maximum pool - N/A
Ungated spillway capacity at maximum pool - 4263
Total spillway capacity at maximum pool - 4263

c. Elevation (USGS Datum) (feet)

Top of dam - 957.0
Maximum pool - 957.0
Normal pool - 919.3
Upstream invert outlet works - 900
Downstream invert outlet works - 889.0
Streambed at center line of dam - 889+
Maximum tailwater - Unknown

d. Reservoir Length (feet)

Normal pool level - 600
Maximum pool level - 2500 (estimated)

e. Storage (acre-feet)

Normal pool level - 14.8
Maximum pool level - 190

f. Reservoir Surface (acres)

Normal pool level - 1.6
Maximum pool level - 7.8

g. Dam

Type - Earth
Length - 320 feet
Height - 67 feet
Top width - 14 feet
Side slopes - Downstream: 2-1/2H:1V; Upstream: 3H:1V
Zoning - Yes
Impervious core - Yes
Cutoff - Yes
Grout curtain - No

h. Regulating Outlet

Type - 12-inch pipe
Length - 50+ feet
Closure - Sluice gate at drop inlet structure
Access - Drop inlet structure
Regulating facilities - Sluice gate

i. Spillway

	<u>Primary</u>	<u>Emergency</u>
Type	Drop inlet	Trapezoidal earth
Length	12 feet (crest width)	channel 30 feet (channel bottom width)
Crest Elevation	938.25	947.0
Upstream Channel	Lake	Trapezoidal earth channel
Downstream Channel	24-inch outlet conduit	Trapezoidal earth channel

SECTION 2 DESIGN DATA

2.1 Design

a. Data Available. The available information was provided by SCS and the Pennsylvania Department of Environmental Resources (PennDER).

(1) Hydrology and Hydraulics. The available information consists of the principal, freeboard and emergency spillway inflow hydrographs and the results of the associated routings.

(2) Embankment. The available information consists of design drawings, geology and soils reports, laboratory soil test results, and the results of slope stability and seepage analyses.

(3) Appurtenant Structures. The available information includes design drawings.

b. Design Features

(1) Embankment

a. As designed, the dam is a zoned embankment including an internal drainage system beneath the downstream slope (Plate 2). Plate 3 illustrates the typical cross section of the dam. Three zones and one transition zone are identified. A 12-foot-wide inclined zone (Zone I) constitutes the impervious core section of the embankment. The Zone I material was classified as silty clay containing 83 to 96 percent fines and with liquid limits in the range of 44 percent and plasticity index in the range of 22. Zone I starts at a level five feet below the dam crest and terminates at a cut-off trench beneath the upstream slope. A five-foot-thick blanket of Zone I material covers the foundation from the upstream toe to the base of the core. Zones II and III constitute the shell sections of the embankment. Zone II material was described as weathered siltstone. The fines of this material had liquid limits in the range of 40 percent and the plasticity index in the range of 16. The Zone II material, the lower portion of the downstream shell, was described as weathered sandstone. A 35-foot-wide filter blanket beneath the downstream toe constitutes the internal drainage system of the embankment and was extended up the abutments to intersect the

Ames Limestone at approximately Elevation 920. Plate 4 illustrates the details of the internal drainage system. Two 12-inch pipes draining into the outlet works impact basin were provided to drain the filter blanket.

- b. The dam was designed to have a 2-1/2 to 1 (horizontal to vertical) slope on the downstream face and a 3 to 1 slope on the upstream face with 10-foot-wide benches on the upstream and downstream faces at Elevations 920.3 and 921.0, respectively.
- c. The subsurface investigation conducted for the dam consisted of numerous borings and test pits. The locations of these borings are shown in Plate 2. Selected boring logs are illustrated in Plates 5 and 6. A typical subsurface profile (Plate 7) consists of up to 6-1/2 feet of colluvium on the left abutment and 3-1/2 to 8 feet of alluvium at the valley bottom. On the right abutment, bed-rock is at the surface. The rock beneath the site includes silts and sandstones. The Ames Limestone was encountered approximately 37 feet below the dam crest elevation. It is reported that rock permeability rates varied significantly between the different rock units. Permeabilities in the abutments, except in the Ames Limestone, ranged between no take and 6.2 feet per day (2×10^{-3} cm/sec). In the limestone, sandstone, and siltstone at the valley floor, permeabilities up to 30 feet per day (10^{-2} cm/sec) were measured.

(2) Appurtenant Structures. The appurtenant structures of the dam include a drop inlet, primary spillway, and emergency spillway. The primary spillway structures include a two-stage reinforced concrete riser, a 24-inch-diameter reinforced concrete conduit through the embankment terminating at a reinforced concrete impact basin at the downstream toe of the dam (Plates 8, 9, and 10). A 12-inch steel pipe from the upstream toe of the dam discharging into the drop inlet structure constitutes the reservoir outlet facilities for the dam. Flow through the reservoir outlet is controlled by a sluice gate located in the drop inlet structure. The outlet conduit is supported on a continuous concrete cradle and is equipped with reinforced concrete cutoff collars (Plate 11).

The emergency spillway is a trapezoidal earth channel excavated into the left abutment (Plate 2). The bottom width of the trapezoidal channel is 30 feet with side slopes 2:1 on both embankment and abutment sides. A 30-foot-wide level section located at Elevation 947 in line with the axis of the embankment constitutes the controlled section of the spillway.

c. Design Data

(1) Hydrology and Hydraulics. Available information indicates that the emergency spillway was designed to pass the PMF hydrograph with a peak of 4857 cfs corresponding to 25.8 inches of precipitation in 6 hours without overtopping the embankment. This hydrograph was routed through the reservoir starting at normal pool (Elevation 919.3), and producing a maximum pool at Elevation 957.0 with a peak emergency spillway outflow of 4263 cfs. The top of the dam was established at Elevation 957.0.

(2) Embankment. Available information indicates that laboratory tests for the embankment design consisted of classification, compaction, and shear strength tests. Shear strength tests consisted of consolidated undrained triaxial tests with pore pressure measurements. The following effective shear strength parameters were reported:

Zone I Material - Effective internal friction angle,
21.5 degrees; effective cohesion,
325 pounds per square foot

Zone II Material - Effective internal friction angle,
33 degrees; effective cohesion,
575 pounds per square foot

Zone III Material - Effective internal friction angle,
33 degrees; effective cohesion,
975 pounds per square foot

It is reported that a slope stability analysis was conducted using the Modified Swedish Circle procedure. The stability of the downstream slopes under steady-state seepage and the stability of the upstream slope under rapid drawdown conditions were considered. For the steady-state seepage analysis, the pool level was taken at Elevation 947.0, which is the emergency spillway crest level. The factors of safety were reported to be 1.7 for the upstream slope and 1.8 for the downstream slope.

(3) Appurtenant Structures. Available information indicates that the appurtenant structures were standard SCS designs.

2.2 Construction. As-built drawings and construction progress reports were available for review. To the extent that can be determined, the construction of the dam was in conformance with SCS specifications. No unusual construction difficulties were reported. The dam was constructed under the supervision of SCS field representatives. It is reported that the earthwork was monitored by field density tests. However, the results were not available for review.

Available information indicates no postconstruction changes.

2.3 Operation. No records of operation are kept.

2.4 Other Investigations. None reported.

2.5 Evaluation

a. Availability. The available information was provided by PennDER and SCS.

b. Adequacy.

(1) Hydrology and Hydraulics. The available information is considered to be adequate to assess the conformity of the design to the current spillway design criteria.

(2) Embankment. A review of the geotechnical aspects of the design indicated that the design generally followed currently accepted practices for subsurface investigation, laboratory testing, analyses, and construction.

(3) Appurtenant Structures. A review of the design drawings indicates that the appurtenant structures were designed and constructed in conformance with currently accepted engineering practices.

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. General. The on-site inspection of PA-484 dam consisted of:

1. Visual inspection of the embankment, abutments, and embankment toe.
2. Visual examination of the emergency spillway and visual portions of the primary spillway.
3. Observation of factors affecting runoff potential of the drainage basin.
4. Evaluation of the downstream hazard potential.

The specific observations are illustrated in Plate 12 and in the photographs in Appendix C.

b. Embankment. The general inspection of the embankment consisted of searching for indications of structural distress, such as cracks, subsidence, bulging, wet areas, seeps and boils, and observing general maintenance conditions, vegetative cover, erosion, and other surficial features.

The overall condition of the dam is considered to be fair. The portion of the downstream slope below the bench was found to be swampy with numerous seeps. The quantity of flow could not be estimated. Another swampy area was found below the toe of the dam near the right abutment. However, no seepage appeared to be associated with the swampy area. No signs of seepage were observed on the abutments or at the junction of the embankment and the abutments.

Although most of the embankment was found to be covered with grass and free of erosion problems, truck tracks on the downstream slope appear to be initiating erosion rills.

The top of the embankment was surveyed relative to the emergency spillway crest elevation and was found to be above the design crest elevation of 957.0.

c. Appurtenant Structures. The appurtenant structures were examined for deterioration or other signs of distress or obstructions that would limit flow. On the date of inspection, the pool was approximately at the crest level of the primary spillway (Elevation 938.25),

indicating that the orifice of the drop inlet structure is obstructed. Other than this problem, the structures were found to be in good condition. No other deficiencies were noted at this time.

d. Reservoir Area. A map review indicated that the watershed is predominantly covered with reclaimed strip mine areas. A review of the regional geology (Appendix E) indicates that only a minor portion of the slopes of the reservoir are likely to be susceptible to landslides. Massive landslides which might affect the storage volume of the reservoir are not considered to be likely.

e. Downstream Channel. Downstream of the dam, the stream flows approximately 2000 feet south where it joins Harmon Creek. Further description of the downstream conditions is included in Section 1.2b.

3.2 Evaluation. The condition of the dam is considered to be fair. The swampy area of the downstream slope of the embankment is considered to be significant relative to the overall stability of the embankment, but not serious at this time. No significant movements or sloughing was observed. However, it is considered advisable to instrument and monitor the seepage and reevaluate the stability of the embankment based on these observations. The erosion rills on the downstream slope of the dam should also be filled and vegetated to prevent future erosion problems.

SECTION 4 OPERATIONAL FEATURES

4.1 Procedure. The reservoir is normally maintained at the crest level of the orifice in the drop inlet structure, with the excess inflow discharging through the orifice. The reservoir outlet pipe can be used to draw down the permanent pool when required. The reservoir outlet pipe gate is normally closed.

4.2 Maintenance of the Dam. The maintenance of the dam is considered to be satisfactory. The downstream and upstream faces of the dam are covered with grass and appear to be annually mowed. However, some erosion rills exist in truck tracks on the downstream slope of the embankment. Washington County personnel reported there is no full-time dam tender responsible for the maintenance of the dam. Maintenance is performed by outside contractors on an as-needed basis.

4.3 Maintenance of Operating Facilities. The only operational feature of the dam is the reservoir outlet pipe sluice gate operated by a hoist located on the drop inlet structure. Since the drop inlet structure was not accessible, this facility could not be examined.

4.4 Warning System. No formal warning system exists for the dam. The dam is accessible via a short road from a secondary highway. Telephone communication facilities are available in residences approximately one mile downstream from the dam.

4.5 Evaluation. The maintenance condition of the dam is considered to be satisfactory. However, the orifice in the drop inlet structure should be cleaned to permit lowering the reservoir to its normal elevation. The erosion rills in the truck tracks on the downstream slope of the dam should be filled and vegetated to prevent future erosion problems.

SECTION 5
HYDRAULICS AND HYDROLOGY

5.1 Evaluation of Features

a. Design Data. PA-484 dam has a watershed of 0.6 square miles and impounds a reservoir with a surface area of 1.6 acres at normal pool level. The capacity of the emergency spillway is reported to be 4,263 cfs, with no freeboard. The emergency spillway was sized to pass a flood corresponding to 25.8 inches of precipitation in 6 hours, without overtopping the embankment.

b. Experience Data. As previously stated, PA-484 dam is classified as an intermediate dam in the high hazard category. Under the recommended criteria for evaluating emergency spillway discharge capacity, such impoundments are required to pass full PMF.

The PMF inflow hydrograph for the reservoir was determined using the Dam Safety version of the HEC-1 computer program, developed by the Hydrologic Engineering Center of the U.S. Army Corps of Engineering. The data used for the computer analyses are presented in Appendix D. The PMF inflow hydrograph was found to have a peak flow of 1,688 cfs. The computer outputs are included in Appendix B.

c. Visual Observations. On the date of inspection, no conditions were observed that would indicate that the emergency spillway capacity would be significantly reduced in the event of a flood.

d. Overtopping Potential. The PMF inflow hydrograph was routed through the reservoir and it was found that the dam can pass the PMF without overtopping. To obtain an upper bound on the maximum pool level during the passage of PMF, the spillway discharge rating was conservatively based on a rectangular cross section, with the base of the rectangle taken equal to the base of the trapezoidal emergency spillway cross section.

e. Spillway Adequacy. The spillway capacity (100 percent PMF) is classified to be adequate according to the recommended criteria.

SECTION 6 STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

(1) Embankment. As discussed in Section 3, in view of the presence of swamp areas on the downstream slope of the dam, a concern exists as to the continued integrity of the embankment. However, no movement or sloughing was observed to indicate the condition is serious at this time. However, instrumentation and monitoring are recommended.

(2) Appurtenant Structures. The structural performance of the appurtenances are considered to be satisfactory.

b. Design and Construction Data

(1) Embankment. Available information indicates that the stability of the embankment was analyzed for steady-state seepage and rapid draw-down conditions, using the Modified Swedish Circle slope stability analysis procedure. The minimum factor of safety was reported to be 1.7 for the upstream slope under rapid drawdown conditions and 1.8 for the downstream slope under steady-state seepage conditions. Strength parameters for the embankment materials were obtained from consolidated undrained triaxial shear tests with pore pressure measurements. Construction progress reports indicate that the dam construction was under the supervision of SCS field representative and the earthwork was monitored by field density tests.

(2) Appurtenant Structures. A review of the design drawings indicates that there are no apparent structural deficiencies that would significantly affect the performance of the appurtenant structures.

c. Operating Records. There are no operating records kept.

d. Post-Construction Changes. None reported.

e. Seismic Stability. The dam is located in Seismic Zone 1 and based on visual observations, the static stability of the dam is considered to be adequate. Therefore, based on the recommended criteria for evaluation of seismic stability of dams, the structure is presumed to present no hazard for earthquakes.

SECTION 7
ASSESSMENT AND RECOMMENDATIONS/PROPOSED REMEDIAL MEASURES

7.1 Dam Assessment

a. Assessment. The visual observations indicate that PA-484 dam is in fair condition. The swampy area below the berm of the downstream slope raises some concern as to the continued integrity of the embankment. Although this condition is not considered to be serious relative to the overall stability of the embankment at this time, due to lack of any signs of movement or sloughing, instrumentation and monitoring are recommended. Reevaluation of the stability of the embankment based on these observations will be required.

The capacity of the spillway (100 percent PMF) is found to be adequate according to the recommended criteria.

b. Adequacy of Information. Available information in conjunction with visual observations and the previous experience of the inspectors is considered to be sufficient to make a reasonable assessment of the condition of the dam.

c. Urgency. The following recommendations should be implemented immediately or on a continuing basis.

d. Necessity for Additional Data. No additional data are considered to be required at this time.

7.2 Recommendations/Remedial Measures. It is recommended that:

1. The embankment should be evaluated by a professional engineer experienced in earth dam design and necessary instrumentation installed to monitor the wet area on the downstream slope of the dam. The stability of the embankment should be evaluated based on the results of these observations and necessary remedial work performed, if required.
2. Around-the-clock surveillance should be provided during unusually heavy runoff and a formal warning system developed to alert the downstream residents in the event of an emergency.
3. The dam and appurtenant structures should continue to be inspected regularly and necessary maintenance should be performed.

PLATES

DRAWN BY	ACS	CHECKED BY	B.E.	3/1/79	DRAWING	78-367-B63
	1-4-79	APPROVED BY	JMP	3.1.79	NUMBER	



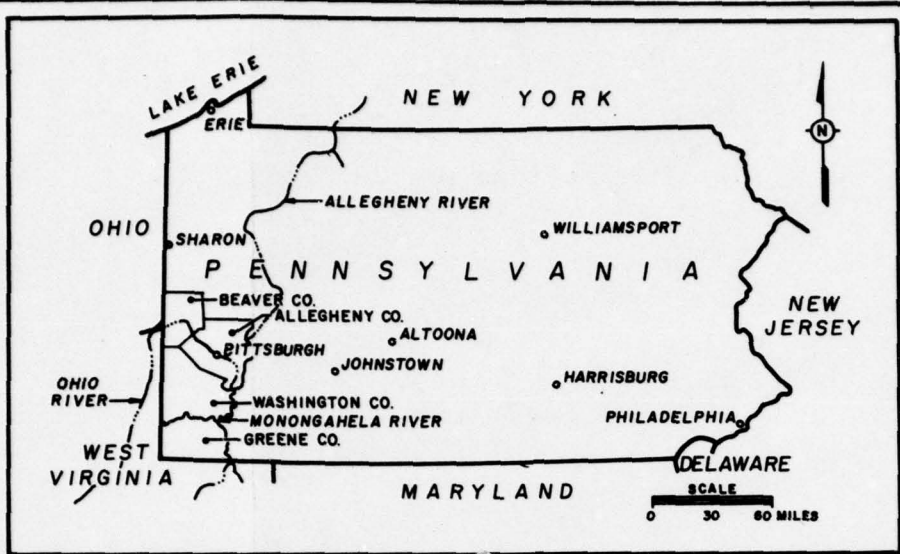
REFERENCES:

U.S.G.S. 7.5' WEIRTON, PA-OHIO QUADRANGLE
DATED 1968, SCALE 1:24000

U.S.G.S. 7.5' BURGETTSTOWN, PA. QUADRANGLE
PHOTOREVISED 1969, SCALE 1:24000

U.S.G.S. 7.5' STEUBENVILLE EAST, W.VA.-PA.
QUADRANGLE, DATED 1968, SCALE 1:24000

U.S.G.S. 7.5' AVELLA, PA. QUADRANGLE
PHOTOREVISED 1969, SCALE 1:24000



KEY PLAN

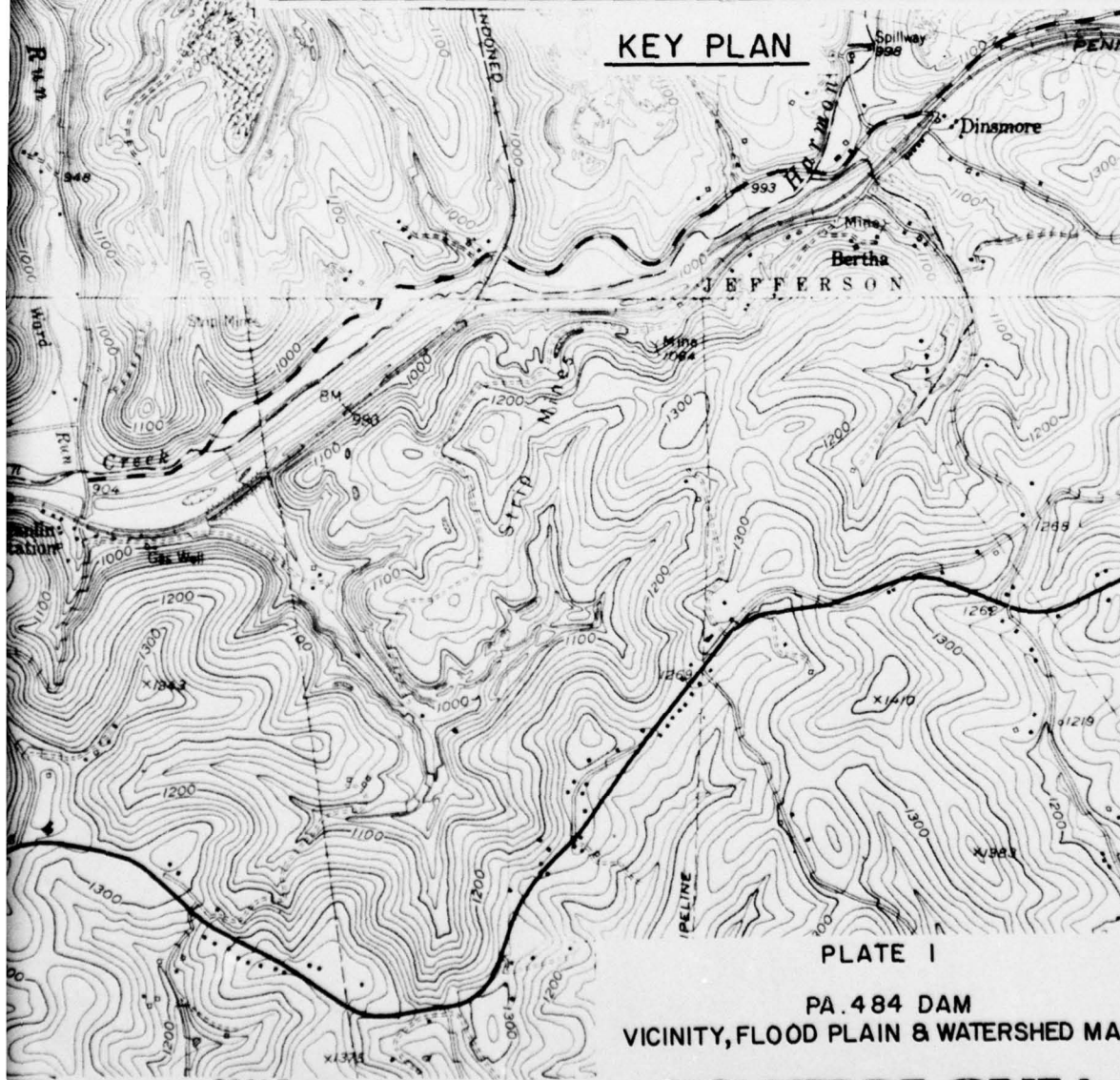
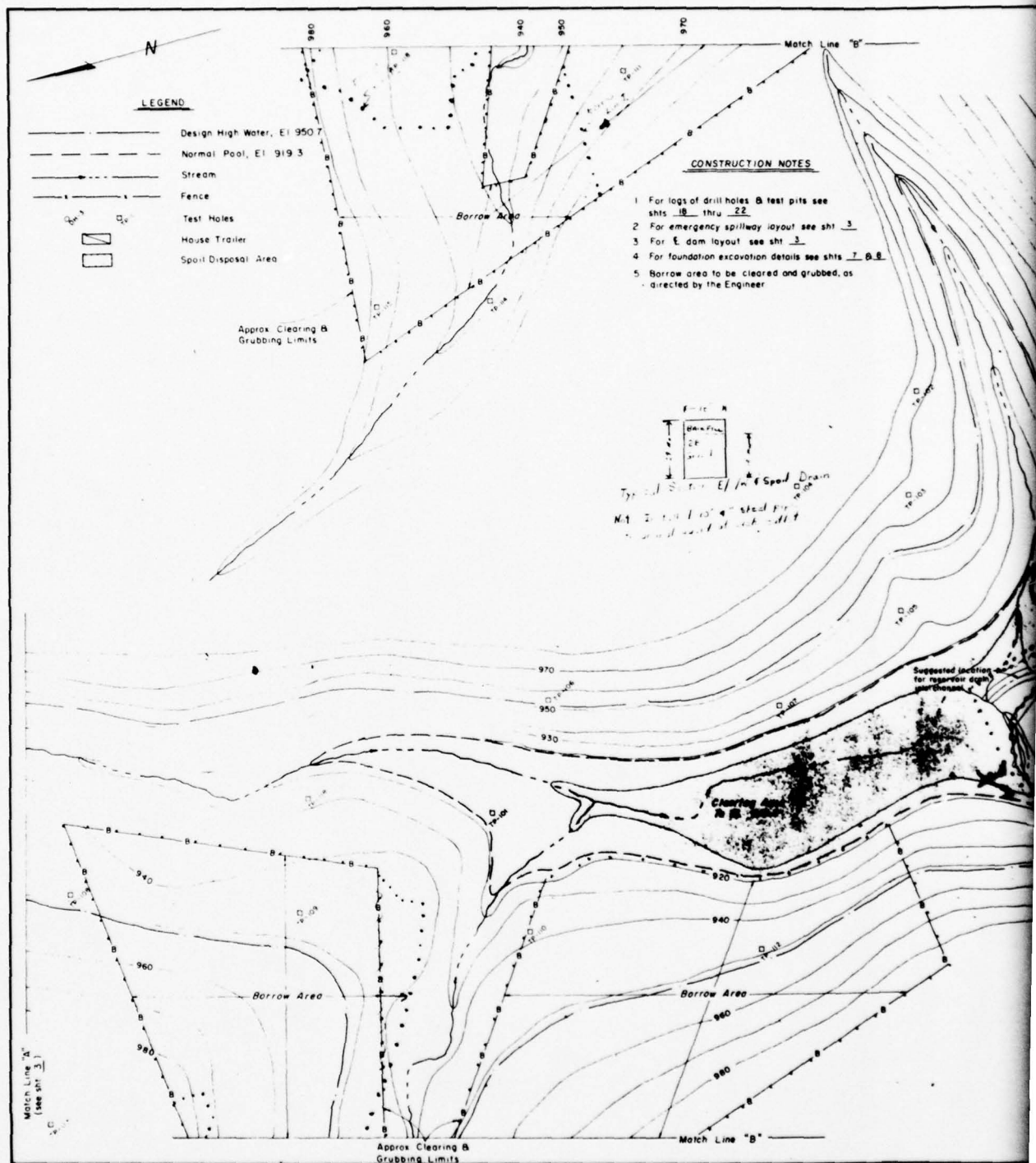


PLATE I

PA. 484 DAM
VICINITY, FLOOD PLAIN & WATERSHED MAP

D'APPOLONIA

DRAWN BY	RDB	CHECKED BY	BE	DRAWING NUMBER	78-367-B64
		1-4-79	JMP	3.1.73	



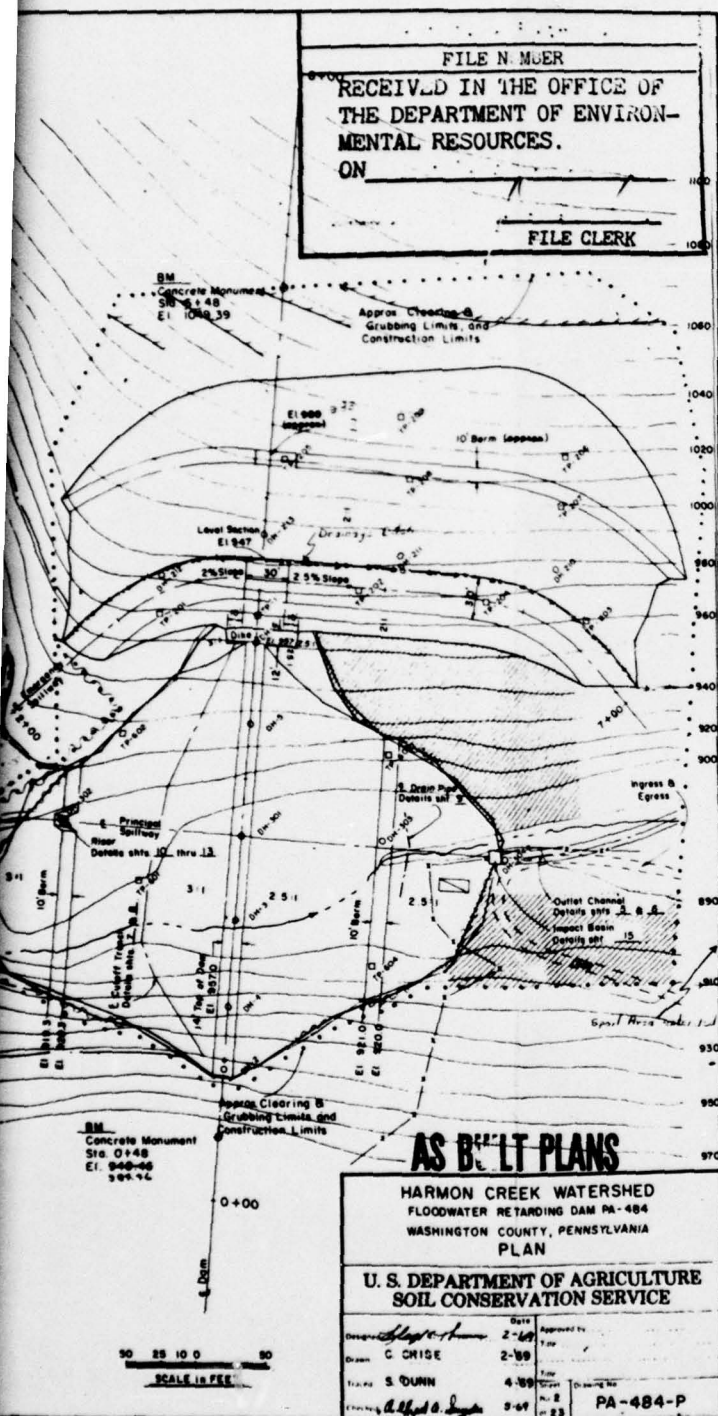
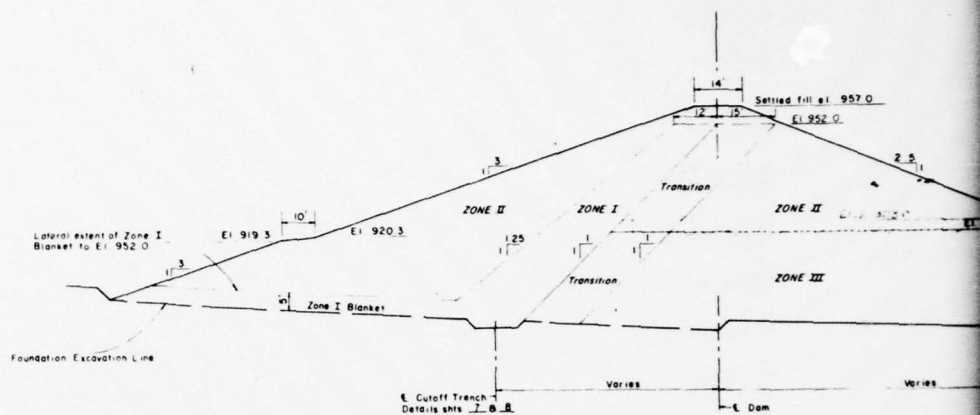


PLATE 2

2

D'APPOLONIA

DRAWN BY RDB CHECKED BY JE 3/1/79 DRAWING NUMBER 78-367-B65
 1-4-79 APPROVED BY JHP 3.1.79



TYPICAL SECTION OF DAM

ZONE	MATERIAL	MAX. ROCK SIZE
I	Material as represented by TP 112, depth 2'0"-4'5", classified as CL and TP 115, depth 2'0"-7'0", classified as CL	6"
II	Material as represented by TP 204, depth 4'0"-10'0", classified as GP (siltstone)	12"
III	Material as represented by TP 208, depth 6'0"-11'0", classified as GP (sandstone)	12"

- 1. For fill adjacent to structures, max.
- 2. Maximum permissible lift thickness
- 3. Water content of fill matrix at time
- 4. For typical compaction curves see
- 5. The 15 foot wide transition section between Zone II and Zone III shall be accomplished by one or by selective mixing and placement of materials, as determined by the Engineer, to provide a gradual transition against Zone

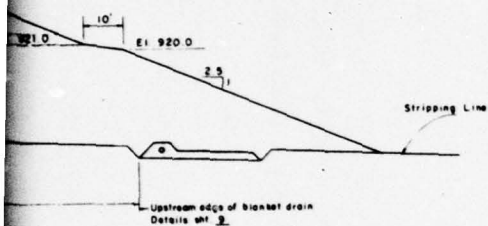
63-73-484

FILE NUMBER

RECEIVED IN THE OFFICE OF
THE DEPARTMENT OF ENVIRON-
MENTAL RESOURCES.

ON

[Signature]
FILE CLERK

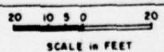


Construction Notes

1. For constructed fill elevations see sht 7
2. Constructed slopes are
 2.92 : 1 Upstream
 2.43 : 1 Downstream

MAX DEPTH	REQ'D WATER CONTENT	COMPACTION	
		Class	Definition
0"	Optimum ± 2.0%	A	At least 95 % of max density by ASTM D-698 Method A
12"	See Const Spec. 23	C	See Const Spec. 23
12"	See Const Spec. 23	C	See Const Spec. 23

AS BUILT PLANS



HARMON CREEK WATERSHED
FLOODWATER RETARDING DAM PA-484
WASHINGTON COUNTY, PENNSYLVANIA
FILL PLACEMENT

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

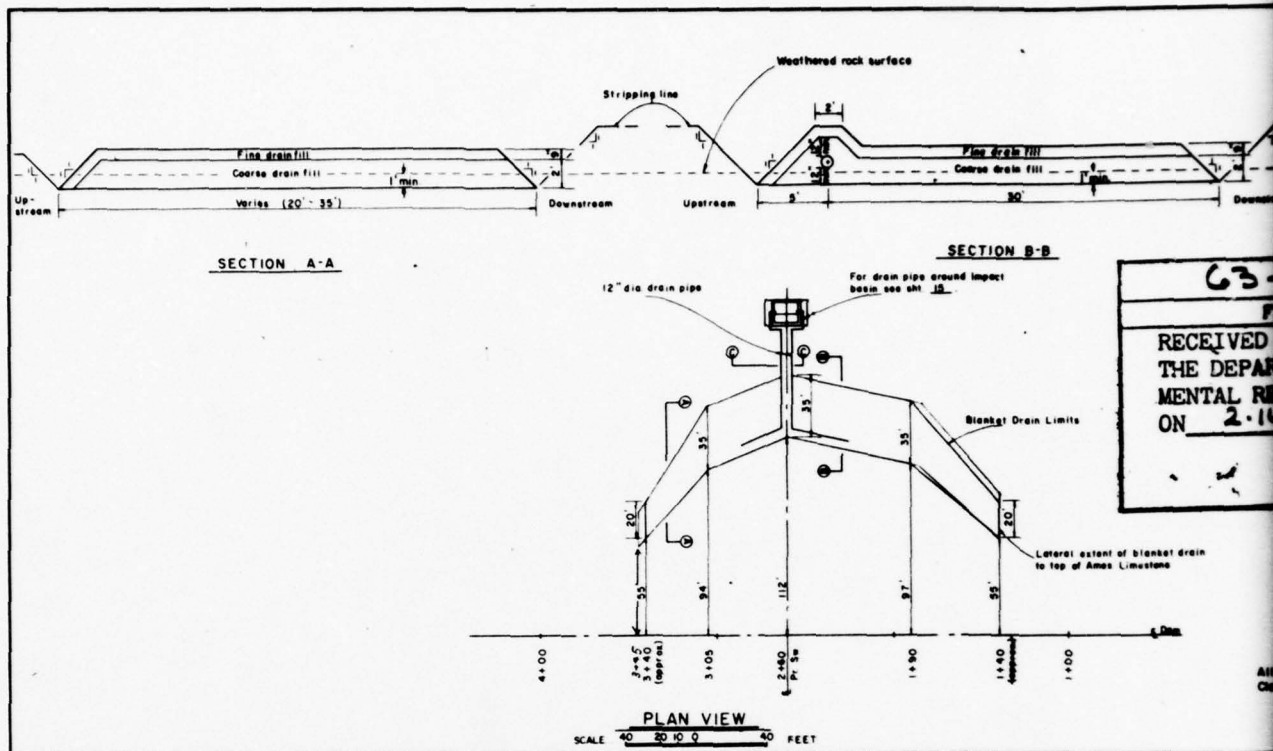
[Signature] Date 4-89 Approved by
 Drawn C. CRICK 4-89
 Check 5-89
 No. 4 Drawing No. PA-484-P

PLATE 3

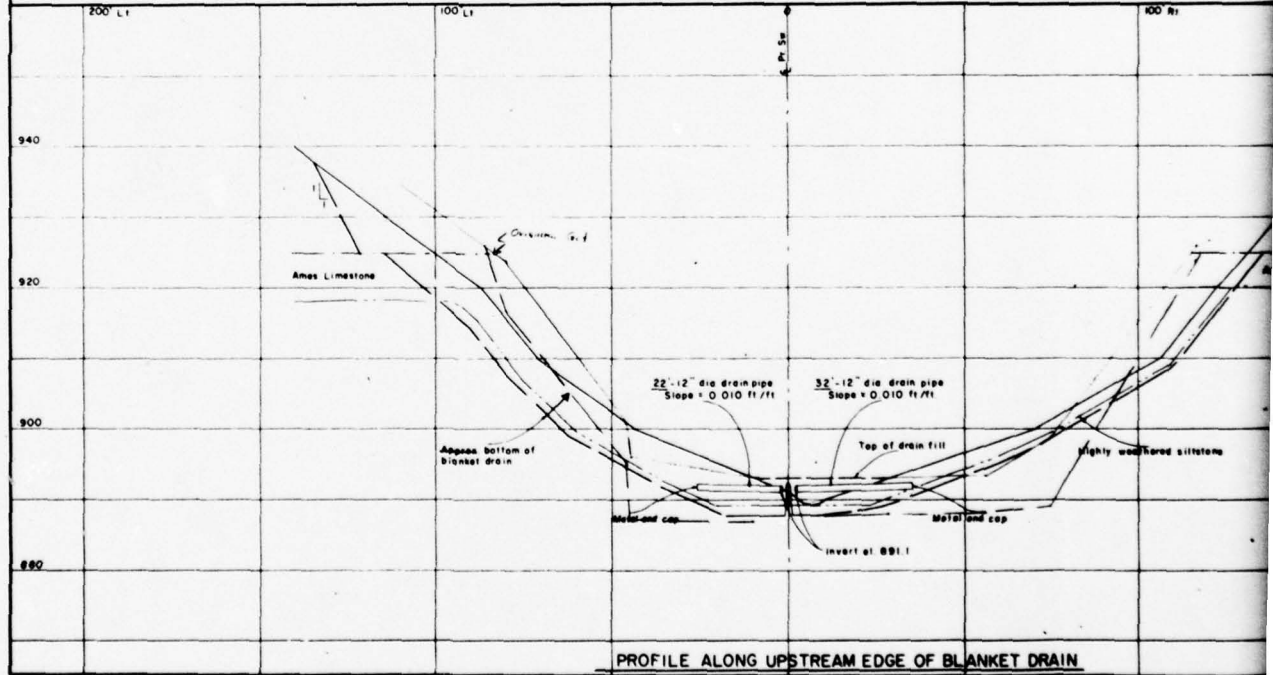
2

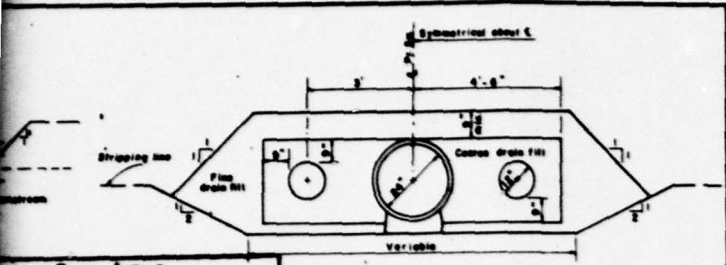
D'APPOLONIA

DRAWN BY **RDB** CHECKED BY **BE** 3/1/79 DRAWING NUMBER 78-367-B66
 1-4-79 APPROVED BY **JHP** 3.1.79



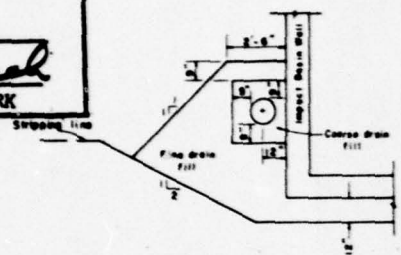
63-
 RECEIVED
 THE DEPAR
 TMENTAL RE
 ON 2-10





3-73 = 429
 FILE NUMBER
 ED IN THE OFFICE OF
 PARTMENT OF ENVIRON-
 RESOURCES.
 14-72
R. J. D. Smith
 FILE CLERK

SECTION C-C



TYPICAL DRAIN FILL AROUND IMPACT BASIN

NOTE
 All drain pipe shall be 12" dia., perforated,
 Class I, Shape I, Type B, 16 gage (Spec. 551)

QUANTITY SUMMARY

- (79'-6" - 12" dia drain pipe, perforated
- 5 - 1' x 2' 90° elbows
- 2 - 1' x 2'-6" 90° elbows
- 1 - 1' x 1' 90° elbow
- 2 - Metal end caps
- 2 - Small animal guards (details and IT)
- 203'-6" Total

GRADATION LIMITS FOR DRAIN FILL

COARSE DRAIN FILL		FINE DRAIN FILL	
Sieve No.	% Passing (based on dry weight)	Sieve No.	% Passing (based on dry weight)
1-1/2"	100	No. 4	100
1"	85 - 100	No. 8	75 - 100
3/4"	70 - 100	No. 16	60 - 100
1/2"	50 - 95	No. 30	40 - 100
3/8"	40 - 85	No. 60	25 - 100
No. 4	10 - 55	No. 100	10 - 100
No. 10	0 - 30	No. 200	0 - 10
No. 20	0 - 10		
No. 200	0 - 5		

AS BUILT PLANS

HARMON CREEK WATERSHED
 FLOODWATER RETARDING DAM NO. 404
 WASHINGTON COUNTY, PENNSYLVANIA
 DRAINAGE

U. S. DEPARTMENT OF AGRICULTURE
 SOIL CONSERVATION SERVICE

Drawn by *C. CRISE* Date *5-59*
 Checked by *[Signature]* Date *5-59*
 Approved by *[Signature]* Date *5-59*
 PA-484-P

DRAWING 78-367-B 67

3/1/79

CHECKED BY JHP

APPROVED BY JHP

DRAWN BY

TP 1, ELEV. 448.0, 4-15, Centerline

Hole Depth	From	To	Description of Materials	Class
0.0	0.5	0.5	Forest litter, roots, etc.	
0.5	1.1	1.1	Gravel, sand and silt, brown, slightly moist, 3/4" fine to med. gravel, 30% sand, 35% low plastic fines. Coarse particles are very soft shale.	GM
1.1	6.0	6.0	Shale, gray, moist, excavated as 3/4" fine to med. gravel, 20% sand. Trace of fines. Shale is thin bedded and can barely be scratched with fingernail. Particles are thin and platy. Shale breaks readily along close spaced joint and cleavage planes.	GP
6.0	10.0	10.0	Carbonaceous shale, moist to 7.5 ft. Below 7.5 ft. water film noted along bedding planes. Shale is very thin bedded and can be scratched with fingernail. Excavated as 50% fairly well-graded gravel, 35% sand. Some clay laminae noted between bedding planes. Coarse particles are thin and platy. No average noted into pit.	
10.0			Bottom of pit - wet hole.	

TP 2, ELEV. 455.2, 0-25, Centerline
 Logged by: J. G. Hirsley 6/18/67
 Drilling Equipment: Jay 12-8 Drill Rig

Hole Depth	From	To	Description of Materials	Unif. Soil Class	STANDARD PENETRATION	SAFETY
					Blow Per 6"	Used No. Type From To
0.0	0.5	0.5	1.5 ft. cut away for drill rig. 0.5 ft. of forest litter, etc. starting at present ground level.	1-2-3	Sgt	1 Jar 0.0 1.5 30
0.5	3.5	3.5	Siltstone, dk. gray to blk. slightly moist, can be scratched with fingernail. Thin bedded, from 3.0-3.5' rock becomes softer with some thin clay laminae. Material from split spoon is 50-60% fine gravel, 35% sand, 10% low plastic fines.	GM-GP	Sgt	1 Jar 0.0 1.5 30
3.5	11.8	11.8	Siltstone, gray, with some red-brown, very highly weathered to dk. with a trace of gravel, 15% sand and 80% low plastic fines. Coarse particles are very soft, easily crushed and molded with fingers. Contains a few coal shale laminae.	GM	Sgt	1 Jar 0.0 1.5 30
11.8	15.5	15.5	Siltstone, red-brown and gray, similar to siltstone at 3.5-11.8' but slightly less weathered. Very soft, easily scratched and broken with fingernail. Cores pieces up to 0.5 ft. long with broken sections and some interbedded clay strata.	GM	Sgt	1 Jar 0.0 1.5 30
15.5	25.5	25.5	Siltstone, gray, highly weathered gray to red-brown, from 15.5-18.5, 19.3-19.5, & 22.7-24.0' siltstone can easily be scratched with fingernail. Core contains numerous broken zones with some very highly weathered clay strata. Heavy iron staining noted. Some vertical fractures noted. Cores pieces up to 0.3 ft. long and generally do not fit well together. Some clay strata are clay.	GM	Sgt	1 Jar 0.0 1.5 30
25.5	30.3	30.3	Siltstone, dk. gray, can be scratched with pencil. Below 27.8 ft. a core return is highly broken with numerous gravel and sand size pieces. From 25.5-27.8' cores pieces up to 0.3 ft. long. Some vertical fractures noted. Some heavy iron staining noted along bedding planes and fractures. Contains some interbedded clay strata. Clay	GM	Sgt	1 Jar 0.0 1.5 30
30.3	38.0	38.0	Siltstone, gray, moist to dk. gray, fossiliferous, can barely be scratched with knife. Cores pieces 0.3-1.3 ft. long and fit fairly well together. Contains some vertical fractures with some iron staining. From 31.7-36.0' siltstone, gray to dk. gray, can be scratched with fingernail, containing vertical fractures with heavy iron staining, lost drill water at 35.0 ft.	GM	Sgt	1 Jar 0.0 1.5 30
38.0	38.3	38.3	Very thin coal seam in clay shale, highly weathered to CL. Black to gray, very soft, some heavy iron staining noted.	GM	Sgt	1 Jar 0.0 1.5 30
38.3	53.3	53.3	Siltstone, dk. gray, can be scratched with pencil point. Clay, very active reaction with dilute HCl. Cores pieces 0.35-1.3 ft. long. Core contains some highly broken zones and some clay strata. From 45.3-47.0' and 50.1-50.8' clay conglomerate with fine gravel and sand size particles. Core contains some vertical fractures, slight iron staining noted in places along this horizon. Cores pieces fit only moderately well together.	GM	Sgt	1 Jar 0.0 1.5 30
53.3	65.2	65.2	Siltstone, gray with lt. gray to pink clay inclusions to 58.0 ft. soft, can be scratched with pencil, cores pieces 0.2-2.0' long and fit fairly well together. Contains some clay laminae along bedding planes. No iron staining noted, appears to be thin bedded.	GM	Sgt	1 Jar 0.0 1.5 30
65.2	69.2	69.2	Siltstone, gray, can be scratched with fingernail, siltstone also noted from 55.2-66.4', dipping 55 to 65 degrees from horizontal, the foot wall appears to have been the up-thrown side, unable to tell amount of movement. Siltstone this horizon has distinct vertical fractures. Clay fracture (filling noted) down to 67 ft. fracture filling appears to have been connected with surface. Some weathering and clay strata noted along fractures, faults and bedding planes; no iron staining noted.	GM	Sgt	1 Jar 0.0 1.5 30
69.2	73.9	73.9	Sandstone, gray, very fine grained sand to silt, can be scratched with pencil, cross-bedded, some of the beds are clay. Cores pieces 0.1-1.5' long and fit fairly well together. Contains some clay laminae. Sandstone is slightly micaceous.	GM	Sgt	1 Jar 0.0 1.5 30
73.9	81.0	81.0	Siltstone, gray, can barely be scratched with pencil. Cores pieces up to 1.1 ft. long and fit fairly well together. No fractures or iron staining noted. Contains some thin clay laminae.	GM	Sgt	1 Jar 0.0 1.5 30
81.0			Bottom of hole - wet hole. CL (9/22/67) 58.8' CL (10/2/67) 59.2'			

TP 3, ELEV. 435.6, 2-20, Centerline
 Logged by: J. G. Hirsley 6/18/67
 Drilling Equipment: Jay 12-8 Drill Rig

Hole Depth	From	To	Description of Materials	Unif. Soil Class	STANDARD PENETRATION	SAFETY
					Blow Per 6"	Used No. Type From To
0.0	0.5	0.5	Forest litter, roots, etc.	1-2-3	Sgt	1 Jar 0.0 1.5 30
0.5	3.5	3.5	Silt, gravel and sand, brown, moist, from 0.5-1.5' & 3.0-3.5' contains 20% fine to med. gravel, 30% sand, fines are low plastic. From approx. 1.5-3.0' appears to be CL with 45% fine to med. gravel, 30% sand and 25% micaceous fines. Coarse particles are siltstone with some sandstone and can be scratched with fingernail.	GM-GP	Sgt	1 Jar 0.0 1.5 30

TP 4, Cont'd

Hole Depth	From	To	Description of Materials	Unif. Soil Class	STANDARD PENETRATION	SAFETY
					Blow Per 6"	Used No. Type From To
15.5	16.1	16.1	Siltstone, gray, thin bedded, (shale) Penetrated with split spoon sampler from 15.5' From 5.5-10.1' siltstone, can be scratched with fingernail. Cores pieces up to 0.25 ft. long; core return shows some very highly broken zones, contains some bedded clay strata and vertical fractures. Some slight iron staining noted. Shale lies below 7.5'.	GM	Sgt	1 Jar 0.0 1.5 30
16.1	18.2	18.2	Sandstone, lt. to med. gray, contains silt to very fine sand and clay particles. Can be scratched with knife. Cores pieces 0.3-0.9' long and fit fairly well together. Shale crossbedded below 12.5 ft. Clay, very active reaction with dilute HCl. Slight iron staining noted.	GM	Sgt	1 Jar 0.0 1.5 30
18.2	32.0	32.0	Siltstone, gray, can be scratched with pencil, clay in some down to 18.0 ft., 0.2-1.1' long and fits fairly well together, especially below 18.0 ft. Some clay laminae noted along bedding planes. Some vertical fractures noted down to 18.0 ft. with some slight iron staining.	GM	Sgt	1 Jar 0.0 1.5 30
32.0			Bottom of hole - wet hole. CL (9/25/67) 3.3' CL (9/26/67) 3.0'			

TP 5, ELEV. 425.5, 1-17, Centerline
 Logged by: J. G. Hirsley 6/18/67
 Drilling Equipment: Jay 12-8 Drill Rig

Hole Depth	From	To	Description of Materials	Unif. Soil Class	STANDARD PENETRATION	SAFETY
					Blow Per 6"	Used No. Type From To
0.0	5.0	5.0	Approx. 0.6 ft. cut away from natural ground of which 0.4 ft. was forest litter, roots, etc. Siltstone, gray, very highly weathered to CL and CL with moderately plastic fines. Appears to contain some secondary brown clay strata. Part of fine range from 30 to 80', coarse particles very soft.	GM	Sgt	1 Jar 0.0 1.5 30
5.0	8.0	8.0	Limestone (Anso), gray, weathered gray-gr. Core can be scratched with knife, core return is highly broken and contains some gravel size pieces; some distinct vertical fractures, heavy iron staining and secondary brown clay are noted along fractures and bedding planes. Limestone also contains some primary strata. Limestone is fossiliferous. This horizon shows intense weathering.	GM	Sgt	1 Jar 0.0 1.5 30
8.0	20.5	20.5	Siltstone, gray, highly weathered to gray-gr. dk. red-brown from 15.0-18.0'. Core return highly broken with numerous gravel and sand size pieces. Distinct vertical fractures noted. Heavy iron staining and some brown secondary clay are noted along bedding planes and vertical fractures. Siltstone also contains some primary gray clay strata. Drilling noted very soft strata from 18.0-20.0', no recovery, silt is highly weathered; very soft, easily scratched with fingernail; clay, very active reaction with dilute HCl.	GM	Sgt	1 Jar 0.0 1.5 30
20.5	26.0	26.0	Siltstone, gray, dk. red-brown from 21.5-24.0', however, iron staining is not as heavy as this section. Core is highly broken except for one piece 21.0-22.5'. Core is soft with clay strata. This section is only slightly clay.	GM	Sgt	1 Jar 0.0 1.5 30
26.0	30.5	30.5	Siltstone, gray, can be scratched with pencil, contains some thin clay strata, 4' pieces up to 0.6 ft. long and fit somewhat well together. Some slight iron staining noted along bedding planes. Contains some distinct vertical fractures. Old clay filling is clay.	GM	Sgt	1 Jar 0.0 1.5 30
30.5	39.0	39.0	Siltstone, med. gray, can be scratched with pencil, thin bedded. Cores pieces 0.3-1.3' long and fit fairly well together. Core return broken from 35.1-35.4', only old iron staining noted in this section.	GM	Sgt	1 Jar 0.0 1.5 30
39.0	43.5	43.5	Sandstone, silt to fine grained sandy, cross bedded with light to med. gray laminae of which is clay. Can be scratched with knife, cores pieces 0.3-1.3' long and fit fairly well together. Contains some thin clay strata. Fault at 39.0-39.3' Siltstone also noted. Fault wall appears to be downthrown side, fault dips approx. 55 degrees from horizontal.	GM	Sgt	1 Jar 0.0 1.5 30
43.5	46.0	46.0	Siltstone, gray, can be scratched with pencil, thin bedded, contains some interbedded clay strata. Cores pieces 0.3-0.7' long and fit fairly well together. Contains very thin clay laminae along bedding planes. Some vertical fractures noted, iron staining this section.	GM	Sgt	1 Jar 0.0 1.5 30
46.0			Bottom of hole - wet hole. CL (10/4/67) 32.0' CL (10/5/67) 31.8'			

TP 6, ELEV. 426.1, 3-13, Centerline
 Logged by: J. G. Hirsley 6/18/67
 Drilling Equipment: Jay 12-8 Drill Rig

Hole Depth	From	To	Description of Materials	Unif. Soil Class	STANDARD PENETRATION	SAFETY
					Blow Per 6"	Used No. Type From To
0.0	2.0	2.0	Approx. 2.0 ft. was cut out from natural ground for set up of drill rig. 0.0-0.5' forest litter, etc. From 0.5-2.0' siltstone, gray-gr. weathered brown with heavy iron staining, thin bedded, very soft. Starting from present ground level.	GM	Sgt	1 Jar 0.0 1.5 30
2.0	2.0	2.0	Siltstone (as described above) 2.0 ft. refusal of split spoon on Anso limestone.	GM	Sgt	1 Jar 0.0 1.5 30
2.0	8.5	8.5	Limestone (Anso) gray, weathered gray-gr. can be scratched with knife, fossiliferous, core return somewhat broken with some gravel size pieces. One piece of core 0.5' long. Limestone contains some distinct vertical fractures. Heavy iron staining and secondary brown clay are noted along fractures and bedding planes. Limestone contains a few interbedded shale units. Drill noted void 0.6-0.8', clay seam at 8.5'. Limestone shows high degree of weathering.	GM	Sgt	1 Jar 0.0 1.5 30
8.5	20.5	20.5	Siltstone, highly weathered to gray-gr. red-brown from 12.7-26.3', can be cut with fingernail from 17.0-18.5' core follows and is scratched with pencil. Return highly broken with numerous gravel size pieces, distinct vertical fractures noted in core, heavy iron staining along fractures and bedding planes. Contains secondary and secondary clay strata. Siltstone is clay from 8.5-12.0'.	GM	Sgt	1 Jar 0.0 1.5 30
20.5	41.0	41.0	Siltstone, med. gray, can be scratched with pencil, core contains some brown clay strata, some light iron staining, cores pieces generally 0.3-0.8' long and up to 2.0 ft. Core return contains a few broken sections down to 38.0 ft. Below 38.0 ft. fine fairly well together, contains some thin clay strata, both of primary & secondary origin. Siltstone contains pink clay laminae from 26.1-26.6'. Sandstone, silt to fine grained sandy, crossbedded, lt. & med. gray, some of	GM	Sgt	1 Jar 0.0 1.5 30

NO. 1 CONT'D

Hole Depth	Description of Materials
From To	
48.4 50.0	are limy. Curved pieces 3.4-2.7 ft. long and fit fairly well together. Core can be scratched with knife. Sandstone is slightly calcareous. Contains some clay laminae, no iron staining noted.
50.0	Siltstone, med. gry, can be scratched with pencil, core pieces 3.1-2.5' long and fit moderately well together. Contains a few fractures, some thin clay laminae between bedding planes, no iron staining noted.
	Bottom of hole - wet hole. WL (10/1/67) 33.5'
	Unable to get further water level readings, rubber expenditure from pocket lodged in hole on 10/1/67.

NO. 2, HOLE, 2.5' CONT'D
 Logged by: S. G. Hirshey
 Drilling Equipment: 2.5' Drill Rig - 122

Hole Depth	Description of Materials	Unif. Soil Class	STANDARD PENETRATION	MOISTURE
From To		Depth	Blow Count	From To %
	Approx. 2.6 ft. cut away for set up. Of this 0.5' was Forest litter, roots, etc. & 2.1' was ON containing 10% small cobble, mostly (0-3") 55% gravel, 30% sand & 15% silty clay. Coarse particles are sandstone & some shale. Particles are not in uniform orientation. Starting from present ground level.	1-3-12	8pt	1.5 1.5 90
	Gravel, silt, clay and sand, low to med-gr, slightly moist. Contains approx. 30% fine to med. gravel, 20% sand and 50% fine plastic fines. From 1.5-3.0' appears to contain material similar to the above. Coarse particles are shale and some sandstone.	13-19-25	2	1.5 3.0 55
		19-25-28	3	3.0 4.5 60
		25-31-34	4	4.5 6.0 65
				6.0 11.5 100
				11.5 18.0 80
				18.0 20.5 85
				20.5 25.5 95
				25.5 30.5 95
				30.5 34.5 100
				34.5 37.0 95
				37.0 39.5 100
				39.5 44.5 90
0.0 4.0				
4.0 7.0				
7.0 11.5				
11.5 21.5				
21.5 32.0				
32.0 40.5				
40.5				

NO. 3, HOLE, 2.5' CONT'D
 Logged by: S. G. Hirshey
 Drilling Equipment: 2.5' Drill Rig - 122

Hole Depth	Description of Materials	Unif. Soil Class	STANDARD PENETRATION	MOISTURE
From To		Depth	Blow Count	From To %
0.0 0.5	Forest litter, roots, etc.	1-3-12	8pt	1.5 1.5 90
0.5 3.0	Silt, gravel and sand, low, slightly moist, 20% fine to med. gravel, 20% sand, fines are non-plastic, coarse	13-19-25	2	1.5 3.0 55
		19-25-28	3	3.0 4.5 60
				4.5 6.0 65
				6.0 11.5 100

NOTE: Soil and rock descriptions and classifications in these logs are based on visual-actual methods. The writer is not responsible for the accuracy of a soil finer than 1/16 inch.

AS BUILT PLANS

63-13 HARMON CREEK WATERSHED A318

FLOODWAY PROJECT NO. 1-68

RECEIVED IN THE OFFICE OF THE U.S. DEPARTMENT OF AGRICULTURE MONTANA WATERSHED SERVICE

ON 2-7-72

FILED

**HARMON CREEK WATERSHED
PA-484
Summary of Field Penetration Tests**

Hole No.	Type of Test	Depth of Test (ft. - in.)	Coefficient of Penetration (lb. per sq. in.)
2	Open hole	1.0-4.0	1.0
		4.0-8.0	Essentially zero
		8.0-12.0	-
		12.0-16.0	0.2
	Pressure	16.0-20.0	0.0
		20.0-24.0	70.5
		24.0-28.0	80.0
		28.0-32.0	Essentially zero
		32.0-36.0	0.20
		36.0-40.0	0.25
		40.0-44.0	0.1
		44.0-48.0	0.1
		48.0-52.0	Essentially zero
		52.0-56.0	-
		56.0-60.0	-
3	Open hole	1.0-4.0	0.2
		4.0-8.0	12.0
		8.0-12.0	10.0
	Pressure	12.0-16.0	29.0
		16.0-20.0	Essentially zero
		20.0-24.0	-
4	Open hole	1.0-4.0	1.0
		4.0-8.0	1.0
		8.0-12.0	0.2
		12.0-16.0	0.1
	Pressure	16.0-20.0	1.0
		20.0-24.0	15.0
		24.0-28.0	1.0
		28.0-32.0	Essentially zero
		32.0-36.0	10.0
		36.0-40.0	1.0
5	Open hole	1.0-4.0	1.0
		4.0-8.0	1.0
		8.0-12.0	0.2
		12.0-16.0	0.1
	Pressure	16.0-20.0	0.1
		20.0-24.0	Essentially zero
		24.0-28.0	0.1
		28.0-32.0	0.1
		32.0-36.0	0.1
		36.0-40.0	0.1
6	Open hole	1.0-4.0	0.1
		4.0-8.0	0.1
		8.0-12.0	0.1
		12.0-16.0	0.25
	Pressure	16.0-20.0	0.1
		20.0-24.0	Essentially zero
		24.0-28.0	0.1
		28.0-32.0	Essentially zero
		32.0-36.0	1.0
		36.0-40.0	0.1
101	Open hole	1.0-4.0	Essentially zero
		4.0-8.0	2.0
		8.0-12.0	5.0
		12.0-16.0	1.0
	Pressure	16.0-20.0	4.0
		20.0-24.0	2.0
		24.0-28.0	10.0
		28.0-32.0	1.0
		32.0-36.0	Essentially zero
		36.0-40.0	0.1
102	Open hole	1.0-4.0	0.1
		4.0-8.0	0.1
		8.0-12.0	0.1
		12.0-16.0	0.1
	Pressure	16.0-20.0	10.0
		20.0-24.0	Essentially zero
213	Open hole	1.0-4.0	0.1
		4.0-8.0	0.1
		8.0-12.0	0.1
		12.0-16.0	0.1
	Pressure	16.0-20.0	25.0
		20.0-24.0	10.0
		24.0-28.0	22.0
		28.0-32.0	1.0
		32.0-36.0	0.1
		36.0-40.0	0.1
303	Open hole	0.0-11.0	0.1

- Indicates that test did not meet all criteria for valid results

AS BUILT PLANS

HARMON CREEK WATERSHED

FLOODWATER RETARDING DAM PA-484

WASHINGTON COUNTY, PENNSYLVANIA

LOGS OF DRILL HOLES AND TEST PITS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed by Date	Reviewed by Date
Drawn by Date	Checked by Date
Project No. 19 PA-484-P	

PLATE 6

2

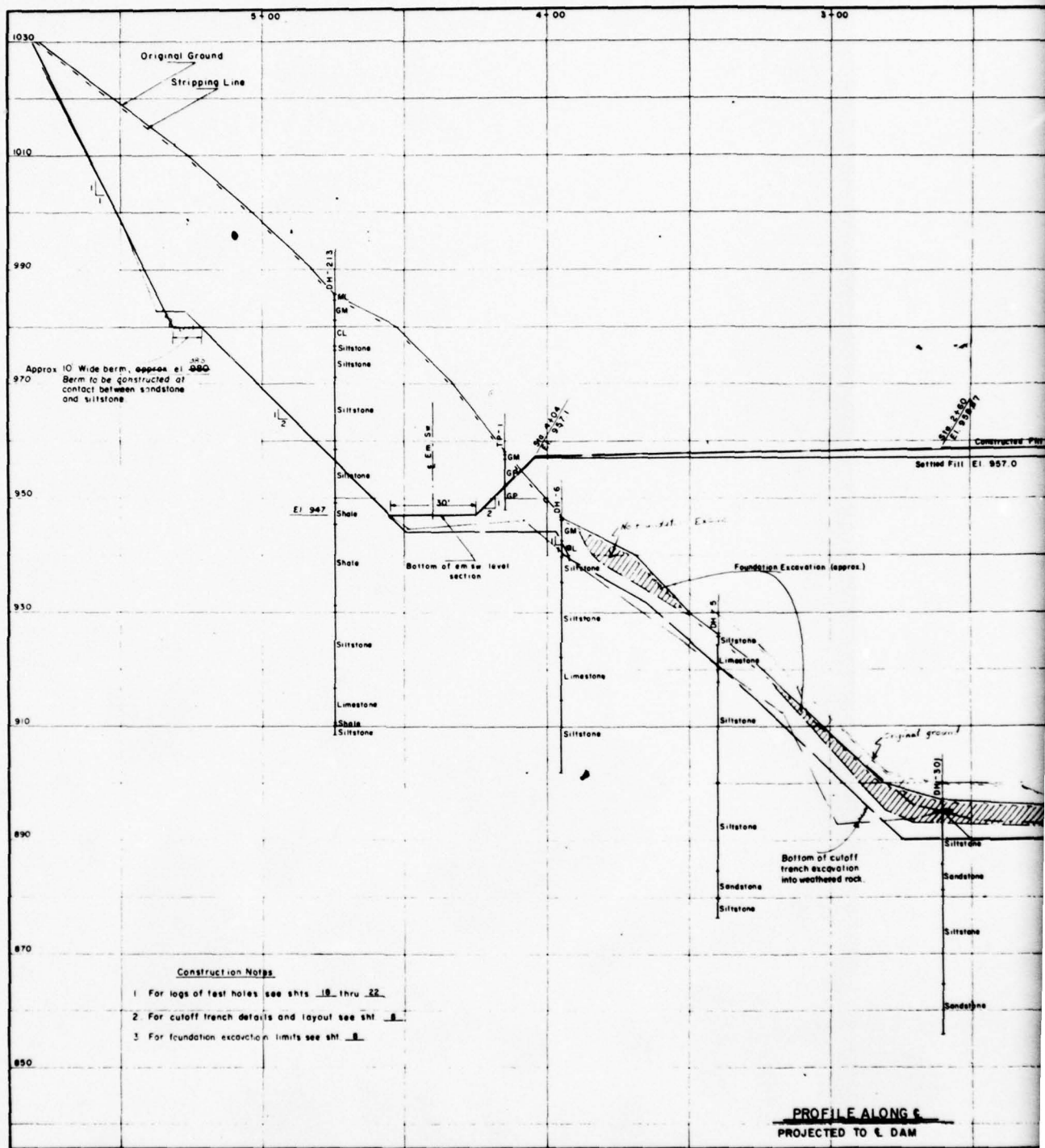
D'APPOLONIA

DRAWN BY
1-4-79

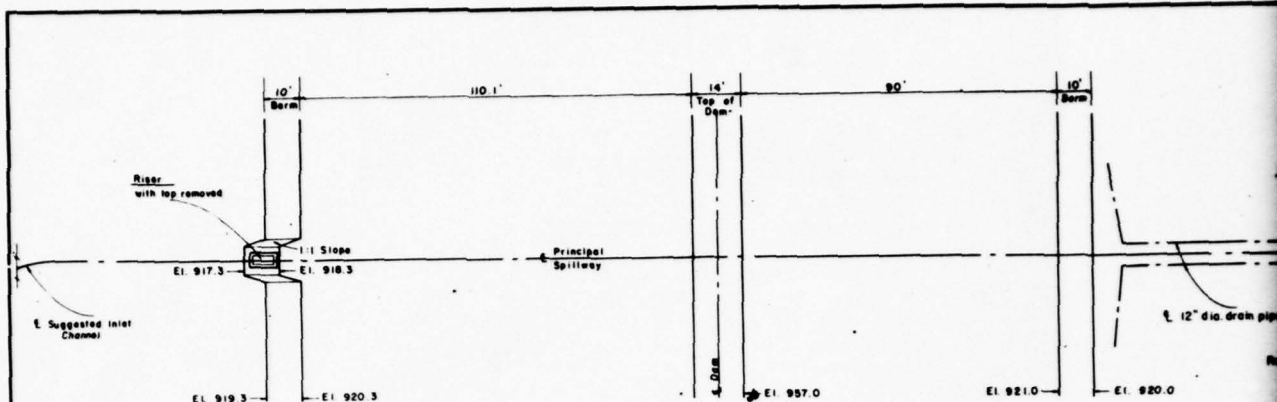
CHECKED BY
3/1/79

APPROVED BY
3.1.79

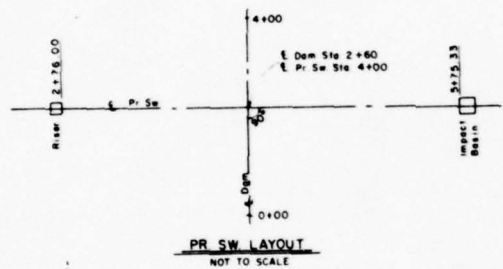
DRAWING 78-367-B69



DRAWN BY **RDB** CHECKED BY **BE** 3/1/79 DRAWING 78-367-B70
 1-4-79 APPROVED BY **JHP** 3.1.79

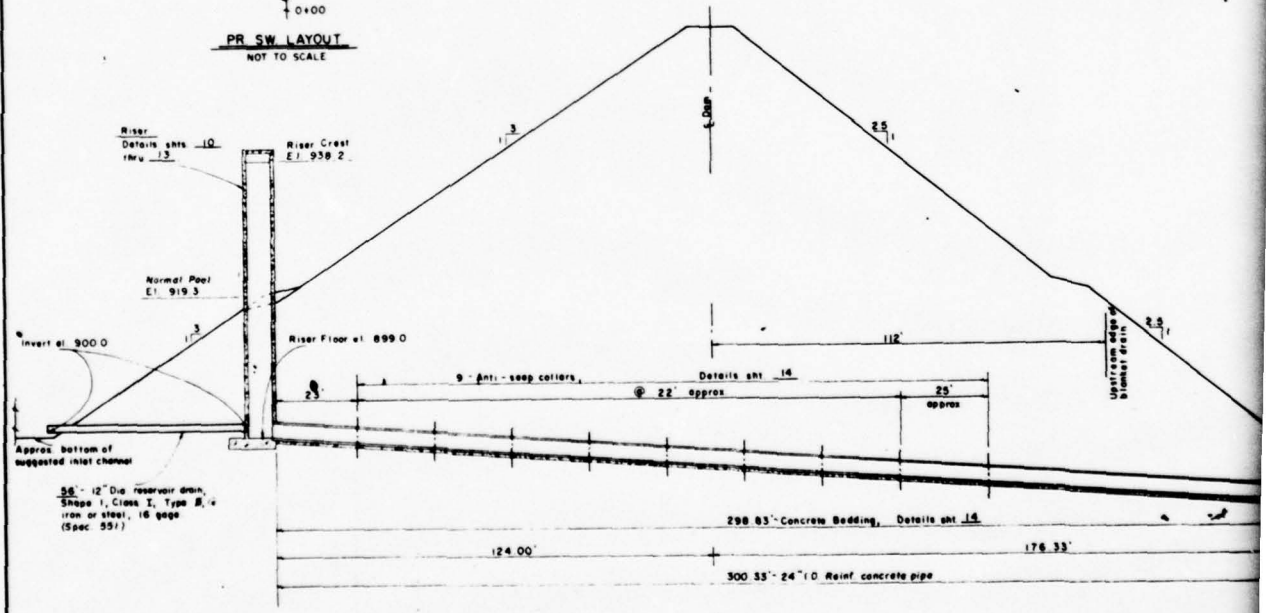


PLAN VIEW
 20 10 5 0 20
 SCALE IN FEET



PR SW LAYOUT
 NOT TO SCALE

- Construction Notes**
1. Outlet end of pipe to be finished so that metal is exposed.
 2. Pipe layout data will be furnished by the

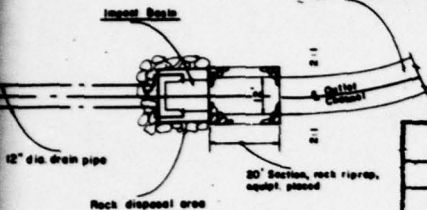


PROFILE ALONG E
 20 10 5 0 20 10 5 0 20
 HORIZONTAL SCALE IN FEET VERTICAL

Outlet Channel

Length - 400' approx 50'

Slope - 0.005 S.W. approx 0.005'



63.75
FILE
RECEIVED IN THE OFFICE OF
THE DEPARTMENT OF ENVIRONMENTAL RESOURCES.
ON 2-14-72

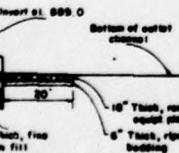
24" I.D. Reinforced Concrete Pipe - 30' Section
Max. Pressure Head = 65' Min. Pressure Head = 5'
Load = 52,555 lbs. per lin. ft., based on O.D. of 2.67' 2.58' O.D. Head
Min. 3 edge bearing strength for:
0.01" Crack non-prestressed pipe = 25,400 lbs. per lin. ft.
0.001" Crack prestressed pipe = 21,500 lbs. per lin. ft.
300.33' - Total length

NO. 606171

COLLAR DATA - FOR 24" I.D. PIPE				24" I.D. PIPE JOINT DATA			
Collar	Dist. From Rear Wall	Height	S.L.	Dist.	S.L.	Dist.	S.L.
1	7.5	235.00	2-1	10.0	235.00	10.0	235.00
2	8.5	235.00	2-2	11.0	235.00	11.0	235.00
3	1.5	235.00	2-3	12.0	235.00	12.0	235.00
4	2.5	235.00	2-4	13.0	235.00	13.0	235.00
5	3.5	235.00	2-5	14.0	235.00	14.0	235.00
6	4.5	235.00	2-6	15.0	235.00	15.0	235.00
7	5.5	235.00	2-7	16.0	235.00	16.0	235.00
8	6.5	235.00	2-8	17.0	235.00	17.0	235.00
9	7.5	235.00	2-9	18.0	235.00	18.0	235.00

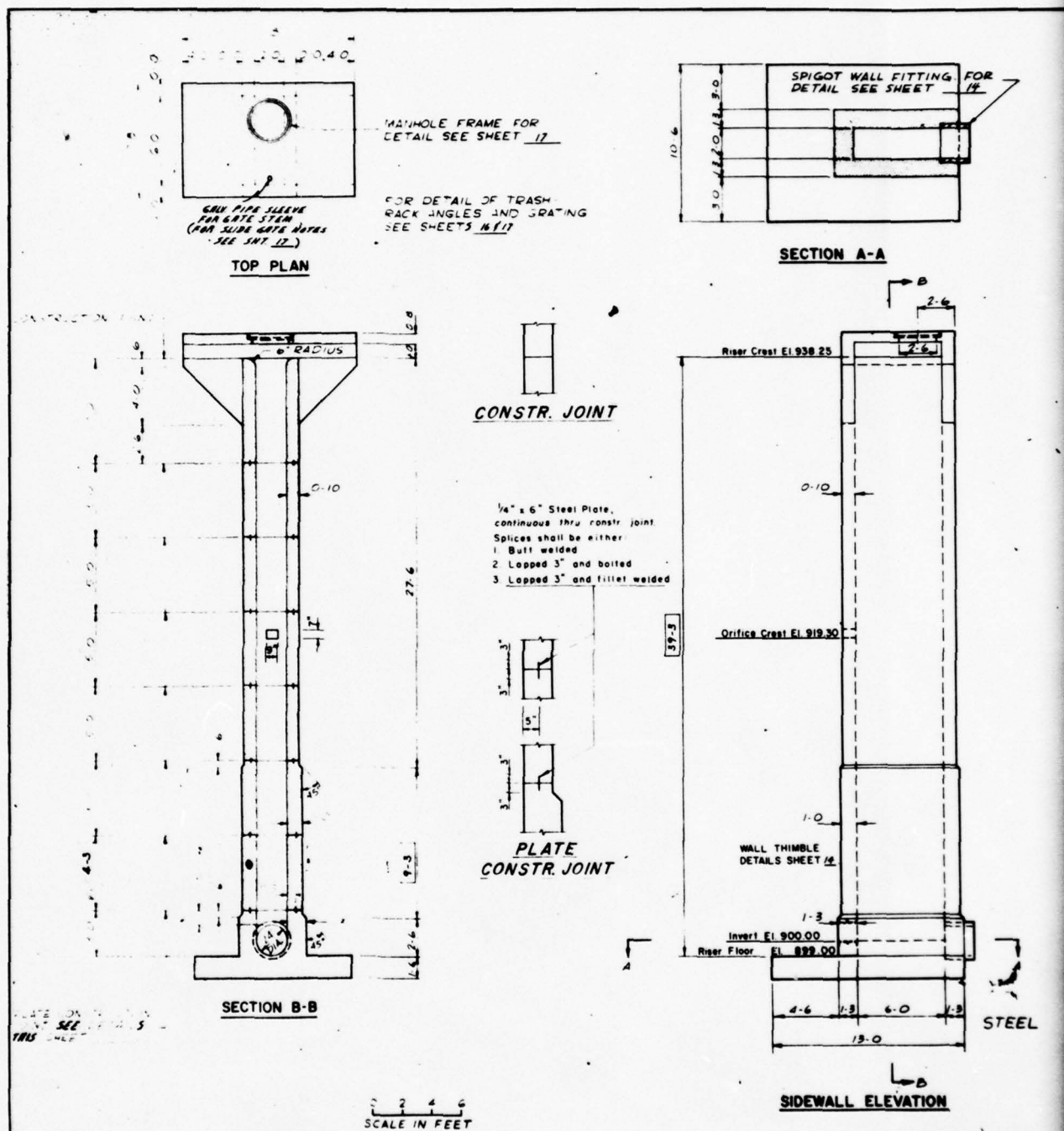
Impact Basin

Details see 12



MAINTENANCE
PLACEMENT
U. S. DEPT. OF ENVIRONMENTAL RESOURCES
C. CRANE
2/14/72

DRAWN BY	R D B	CHECKED BY	B E	DRAWING NUMBER	78-367-B 71
	1-4-79	APPROVED BY	JMP		3.1.73



CLASS 4000 CONCRETE 37.5 CU. Y

STEEL SCHEDULE

MARK	SIZE	QUANTITY	LENGTH	TYPE	B	C	TOTAL LENGTH
B1	6	15	10-0	1	-	-	50-0
B2	6	11	12-6	1	-	-	137-6
B3	6	18	7-5	1	-	-	183-6
B4	9	18	6-9	21	3-2	3-7	121-6
B5	6	11	12-6	1	-	-	137-6
B6	6	14	10-0	1	-	-	140-0
B7	6	2	4-3	1	-	-	8-6
B8	3	5	4-6	21	1-0	3-6	22-6
B9	3	5	6-7	21	1-0	5-7	19-9
B10	3	16	6-7	21	1-0	5-7	108-4
B11	3	2	4-6	21	1-0	3-6	9-0
B12	6	8	6-8	1	-	-	89-4
B13	3	4	2-8	1	-	-	10-8
B14	3	10	7-10	21	2-11	4-11	78-4
B15	3	4	5-9	21	0-10	4-11	23-0
B16	3	4	5-7	21	0-8	4-11	22-4
B17	3	2	6-5	21	1-8	4-11	12-10
B18	7	4	5-0	21	3-0	3-0	32-0
B19	9	18	4-4	1	-	-	78-0
B20	3	5	3-8	1	-	-	18-4
B21	3	2	3-8	1	-	-	7-4
B22	3	2	2-5	1	-	-	4-10
B23	3	2	2-7	1	-	-	5-2
B24	5	8	2-4	11	-	-	18-8
R1	5	12	10-10	1	-	-	120-0
R2	3	4	10-10	1	-	-	43-4
R3	3	16	10-10	1	-	-	175-4
R4	3	8	8-7	1	-	-	70-0
R5	3	18	6-8	1	-	-	180-0
R6	3	10	2-8	1	-	-	26-8
R7	7	36	6-0	21	3-0	3-0	238-0
R8	6	18	6-8	1	-	-	93-4
R9	3	10	2-8	1	-	-	26-8
R10	6	36	7-8	21	2-10	4-10	276-0
R11	3	16	3-8	1	-	-	58-8
R12	3	8	3-8	1	-	-	29-4
R13	6	4	7-4	21	2-8	4-8	29-4
R14	3	10	11-7	1	-	-	115-10
R15	3	4	11-7	1	-	-	46-4
R16	3	12	11-7	1	-	-	139-0
R17	3	6	11-7	1	-	-	69-6
R18	3	20	6-8	1	-	-	188-4
R19	3	8	2-8	1	-	-	21-4
R20	6	40	7-8	21	2-8	4-8	293-4
R21	3	18	6-8	1	-	-	93-4
R22	3	8	2-8	1	-	-	21-4
R23	3	40	7-0	21	2-6	4-6	280-0
R24	3	10	11-7	1	-	-	115-10
R25	3	4	11-7	1	-	-	46-4
R26	3	12	11-7	1	-	-	139-0
R27	3	6	11-7	1	-	-	69-6
R28	3	10	6-8	1	-	-	66-8
R29	3	8	2-8	1	-	-	21-4
R30	3	24	7-0	21	2-6	4-6	168-0
R31	3	8	6-8	1	-	-	53-4
R32	3	8	2-8	1	-	-	21-4
R33	3	16	7-0	21	2-6	4-6	112-0

63-73-AB-10

FILE NUMBER

RECEIVED IN THE OFFICE OF
THE DEPARTMENT OF ENVIRON-
MENTAL RESOURCES.
ON 3-14-72

FILE CLERK

*1	3	10	6-6	1	-	-	65-0
*2	3	6	8-3	1	-	-	49-6
*3	3	10	6-9	1	-	-	67-6
*4	3	6	8-3	1	-	-	49-6
*5	3	12	6-8	1	-	-	80-0
*6	3	4	2-8	1	-	-	0-8
*7	3	2	3-8	1	-	-	7-4
*8	3	2	6-2	1	-	-	12-4
*9	3	2	8-8	1	-	-	17-4
*10	3	2	11-2	1	-	-	22-4
*11	3	24	7-0	21	2-6	4-6	68-0
*12	3	4	4-8	1	-	-	8-8
*13	3	4	3-5	1	-	-	13-9
*14	3	4	2-2	1	-	-	8-8
*15	3	4	7-3	19	1-8	5-7	29-0
*16	3	2	3-8	1	-	-	7-4
*17	3	2	6-2	1	-	-	12-4
*18	3	2	8-8	1	-	-	17-4
*19	3	2	11-2	1	-	-	22-4
*20	3	4	4-8	1	-	-	8-8
*21	3	4	3-5	1	-	-	13-9
*22	3	4	2-2	1	-	-	8-8
*23	3	4	7-3	19	1-8	5-7	29-0
*24	3	2	11-2	1	-	-	22-4
*25	4	18	6-8	1	-	-	80-0
*26	6	2	3-2	1	-	-	6-4
*27	4	6	11-2	1	-	-	67-0
*28	4	4	4-3	1	-	-	7-0
*29	5	20	5-11	21	1-5	4-6	118-4
*30	3	2	4-10	21	1-5	3-5	9-8
*31	3	2	2-3	21	1-5	0-0	4-6
*32	3	2	11-2	1	-	-	22-4
*33	4	6	11-2	1	-	-	27-0
*34	4	4	4-3	1	-	-	7-0

AS BUILT PLANS

QUANTITIES

4 BARS	254-4	170 LBS
5 BARS	348-8	388-4 LBS
6 BARS	1858-8	2191 LBS
7 BARS	280-0	664 LBS
9 BARS	199-6	678 LBS
		7543 LBS

HARMON CREEK WATERSHED
FLOODWATER RETARDING DAM PA-484
WASHINGTON COUNTY, PENNSYLVANIA
RISER STRUCTURAL DETAILS

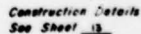
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

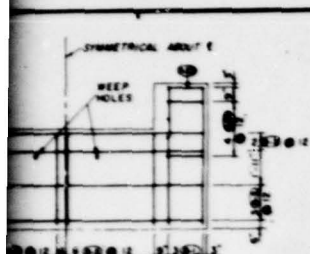
Drawn by <i>David H. Jones</i>	Checked by <i>P. H.</i>
Date <i>3-14-72</i>	Scale <i>1" = 10'</i>
Project <i>PA-484-P</i>	Sheet <i>9</i>

PLATE 9

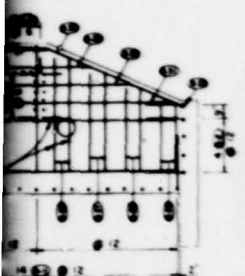
D'APPOLONIA

DRAWN BY

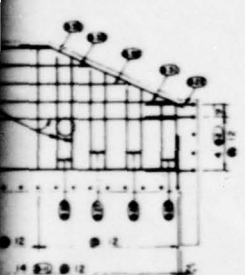




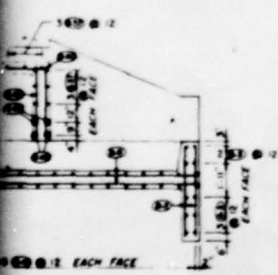
SECTION B-B UPSTREAM FACE



SECTION A-A OUTSIDE FACE

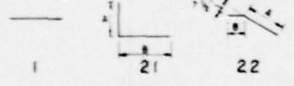


SECTION A-A INSIDE FACE



SECTION ON E

STEEL SCHEDULE									
NO.	LOCATION	QUANTITY	LENGTH	TYPE	A	B	TOTAL FT.		
1	CUTOFF	4	5	7	9	1	28.50		
2		2	5	5	5	1	10.00		
3		10	5	15	6	1	150.00		
4		10	5	2	7	1	25.83		
5		20	5	5	0	1	100.00		
6		2	5	8	0	2	10.00		
7		5	5	4	0	1	2.00		
8		4	5	15	6	1	62.00		
9	FLOOR	32	5	15	0	1	480.00		
10		32	5	15	6	1	496.00		
11		20	5	4	0	2	224.00		
12	INLET WALL	8	5	4	3	2	64.00		
13		2	5	9	0	1	10.00		
14		8	5	4	3	2	34.00		
15		8	5	3	3	1	26.00		
16		4	5	5	9	2	92.00		
17		2	5	7	0	1	84.00		
18		8	5	8	3	2	64.00		
19		5	5	1	9	1	8.25		
20		5	5	3	0	2	15.00		
21		8	5	5	0	1	24.00		
22	WINS WALLS	10	5	5	2	2	51.67		
23		10	5	4	1	2	40.83		
24	SIDE WALLS	2	5	8	0	2	96.00		
25		2	5	6	9	1	81.00		
26		8	5	6	3	1	50.00		
27		8	5	5	6	1	44.00		
28		8	5	4	6	1	36.00		
29		8	5	3	6	1	28.00		
30		8	5	3	0	1	208.00		
31		4	5	12	6	1	50.00		
32		4	5	10	3	1	41.00		
33		4	5	8	0	1	32.00		
34		4	5	5	9	1	23.00		
35		4	5	10	1	2	40.33		
36	BAFFLE	34	5	4	0	2	34.00		
37		5	5	8	6	1	76.50		
38		2	5	4	9	2	9.50		
39		4	5	5	1	2	20.33		
40		4	5	6	1	2	24.33		
41		2	5	2	6	1	5.00		
42		4	5	2	9	1	11.00		
43		4	5	3	9	1	4.00		
44		2	5	5	0	1	10.00		
45		2	5	3	3	1	6.30		
46		8	5	2	3	1	18.00		
47	OVERHANG	2	5	4	8	1	9.00		
48		5	5	8	0	1	9.00		



BAR TYPES

QUANTITIES THIS SHEET ONLY

REINFORCING STEEL
NO. 5 BARS 3.48 32 LIN FT 363.10 LBS

CONCRETE CLASS 4000 250 CU YDS

FILE NUMBER

RECEIVED IN THE OFFICE OF
THE DEPARTMENT OF ENVIRONMENTAL RESOURCES.
ON **AS BUILT PLANS**
FILE CLERK

HARMON CREEK WATERSHED
FLOODWATER RETARDING DAM PA-484
WASHINGTON COUNTY, PENNSYLVANIA
IMPACT BASIN DETAILS

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Frank C. Schaefer
M. H. MORGAN

F. R. FARMER SEPT 64 15 PA-484-P

DRAWING 78-367-B73
NUMBER

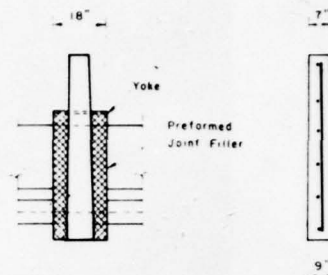
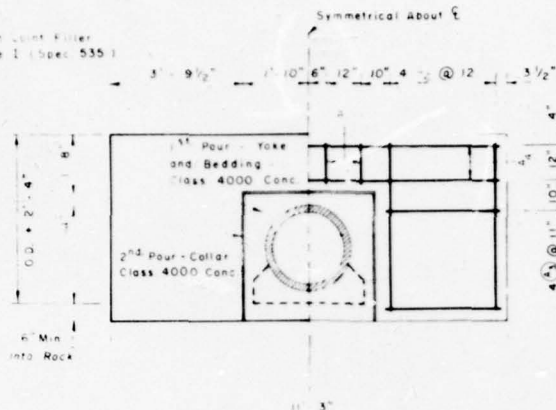
3/1/79
3.1.79

BE
JMP

CHECKED BY
APPROVED BY

DRAWN BY

Preformed Joint Filler
4" Wide, Type 1 (Spec 535)

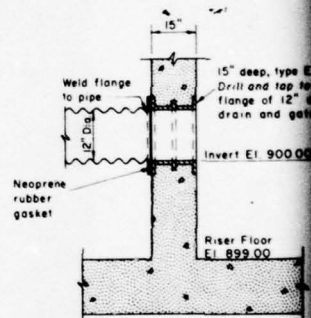


REINFORCED CONCRETE ANTI-SEEP COLLAR

9 - Req'd

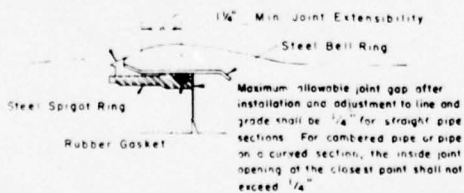


CONCRETE BEDDING (Class 4000 Conc)

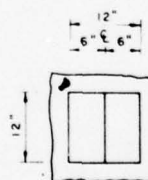


RESERVOIR DRAIN WALL TH

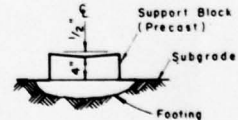
Seal with Joint Compound (Spec 536)



REINFORCED CONCRETE PIPE - JOINT DETAILS



PLAN



FRONT ELEV.

SUGGESTED SUPPORT BLOCK

NOTE: The contractor shall determine the number and size of the blocks.

BAR TYPE

Length

ANTI-SEEP COLLAR STEEL SCHEDULE

Mark	Size	Length	Type	Quan / Collar	Total Quan	Total Length
A 1	4	1-3	1	4	36	45-0
A 2	4	4-6	1	8	72	142-0
A 3	4	5-3	1	8	72	234-0
A 4	4	10-8	1	2	18	183-6

NOTE

Bar lengths do not change with changes in outside diameter of pipe.

QUANTITIES (This Sheet Only)

STEEL

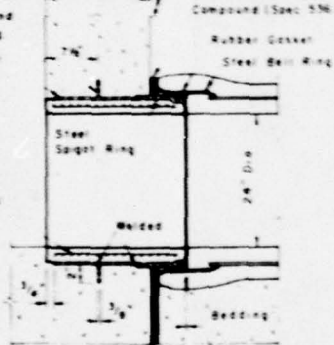
No. 4 Bar 8-4 5 Ft. 1 000 Lbs.
10 #2 Welded Mesh

CONCRETE

FILE NUMBER
RECEIVED IN THE OFFICE OF THE DEPARTMENT OF ENVIRONMENTAL RESOURCES.
ON <u>1/11/61</u>
FILE CLERK <u>[Signature]</u>

Water Stop and
Stiffener Ring
Steel Cylinder

Welded Fabric
or Wire Mesh
Riser Floor



1/2" Prefabricated Joint Filler,
Type I (Spec 535) Placed
between riser and bedding

Joint gap not to
exceed 1/4"

SPIGOT WALL FITTING

AS BUILT PLANS

HARMON CREEK WATERSHED
FLOODWATER RETARDING DAM PA-484
WASHINGTON COUNTY, PENNSYLVANIA

CONDUIT DETAILS

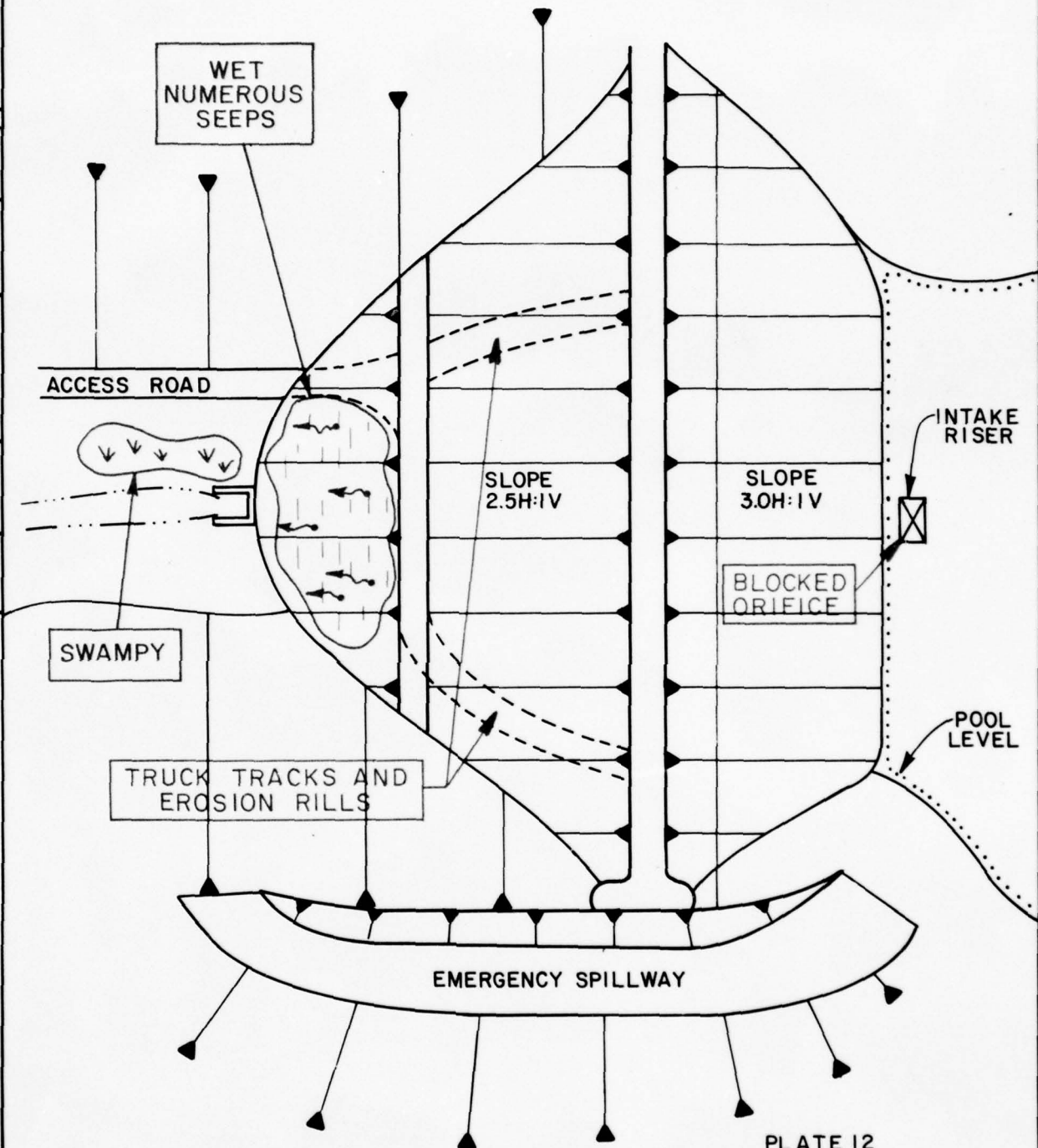
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Drawn by <u>[Signature]</u>	Checked by <u>[Signature]</u>	PA-484-P
Date <u>1-11-61</u>	Scale <u>1\"/> </u>	

PLATE II

D'APPOLONIA

DRAWN BY	MEM	CHECKED BY	3/1/79	DRAWING NUMBER	78-67-A9
BY	1-3-79	APPROVED BY	JAP		



NOTES:

1. EMERGENCY SPILLWAY
FREEBOARD: 9.6 FT.
2. POOL LEVEL DATE OF
INSPECTION: 18.7 FT. BELOW
CREST OF DAM

PLATE 12
PA. 484 DAM
GENERAL PLAN
FIELD INSPECTION NOTES
FIELD INSPECTION DATE: DEC. 5, 1978

D'APPOLONIA

APPENDIX A
CHECKLIST
VISUAL INSPECTION
PHASE I

APPENDIX A

CHECKLIST
VISUAL INSPECTION
PHASE I

NDI I.D. NO. PA-489
ID# DER I.D. NO. 63-73

NAME OF DAM PA-484 COUNTY Washington STATE Pennsylvania

TYPE OF DAM Earth HAZARD CATEGORY High

DATE(S) INSPECTION December 4, 1978 WEATHER Sunny TEMPERATURE 30s

POOL ELEVATION AT TIME OF INSPECTION 938.3 M.S.L. TAILWATER AT TIME OF INSPECTION 889.5 M.S.L.

INSPECTION PERSONNEL:

REVIEW INSPECTION PERSONNEL:
(December 20, 1978)

Bilgin Erel

E. D'Appolonia

Wah-Tak Chan

L. D. Andersen

J. H. Poellett
B. Erel

Bilgin Erel RECORDER

VISUAL INSPECTION
PHASE I
EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None.	
SLOUCHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Minor erosion rills in the truck tracks on the downstream face of the dam.	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Crest elevation is .2 to .8 foot above the design crest elevation (Elevation 957) relative to the emergency spillway crest level.	
RIPPAP FAILURES	No riprap on the dam.	

VISUAL INSPECTION
PHASE I
EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	No signs of distress.	
ANY NOTICEABLE SEEPAGE	The downstream slope of the dam below berm level is swampy. There are numerous seeps which appear to be percolating back into the embankment. The quantity of the seepage could not be estimated.	Necessary instrumentation should be installed to monitor the wet area on the downstream slope of the embankment.
STAFF GAGE AND RECORDER	None.	
DRAINS	Embankment drainpipes drain into the sides of the outlet structure. The depth of the flow in the 12-inch drainpipes, left pipe (looking downstream) - 1/2 inch; right pipe, 2 inches.	

VISUAL INSPECTION
PHASE I
OUTLET WORKS

VISUAL EXAMINATION OF CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
	Visible portions of the outlet works are in good condition.	
INTAKE STRUCTURE	The pool is above normal pool elevation, indicating that the orifice on the drop inlet structure is obstructed.	The orifice in the drop inlet structure should be cleaned.
OUTLET STRUCTURE	Good condition.	
OUTLET CHANNEL	No significant obstructions.	
EMERGENCY GATE	Reservoir drainpipe hoist is located in the drop inlet structure. Not accessible for inspection.	The operational condition of reservoir drainpipe gate should be periodically evaluated.

VISUAL INSPECTION
PHASE I
UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	The emergency spillway has no concrete overflow structure.	
APPROACH CHANNEL	A trapezoidal earth channel is in good condition.	
DISCHARGE CHANNEL	A trapezoidal earth channel is in good condition.	
BRIDGE AND PIERS	None.	

VISUAL INSPECTION
PHASE I
GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	N/A	
APPROACH CHANNEL	N/A	
DISCHARGE CHANNEL	N/A	
BRIDGE PIERS	N/A	
GATES AND OPERATION EQUIPMENT	N/A	

VISUAL INSPECTION
PHASE I
INSTRUMENTATION

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None.	
OBSERVATION WELLS	None.	
WEIRS	None.	
PIEZOMETERS	None.	
OTHER	See Page A3 of 9 for description of the embankment drainpipes.	

VISUAL INSPECTION
PHASE I
RESERVOIR
OBSERVATIONS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Steep to moderate.	
SEDIMENTATION	Unknown.	
UPSTREAM RESERVOIRS	None.	

VISUAL INSPECTION
PHASE I
DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
	No apparent obstructions immediately downstream of the dam.	
SLOPES	No apparent instability (immediately downstream of the dam).	
APPROXIMATE NUMBER OF HOMES AND POPULATION	There are three homes approximately 1/2 mile downstream of the dam, and about 20 homes about 2 miles downstream of the dam. Population approximately 100 (first two-mile reach).	

APPENDIX B
CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
AND HYDROLOGIC AND HYDRAULIC
PHASE I

APPENDIX B

CHECKLIST

ENGINEERING DATA

DESIGN, CONSTRUCTION, OPERATION

PHASE I

NAME OF DAM PA-484

ID# MDI I.D. NO. 489

DER I.D. NO. 63-73

ITEM	REMARKS
AS-BUILT DRAWINGS	The drawings are available in the state and SCS files.
REGIONAL VICINITY MAP	See Plate 1.
CONSTRUCTION HISTORY	The dam was designed by the U.S. Department of Agriculture, Soil Conservation Service, during 1967 and 1968. It was constructed by Louis McMasters, Inc., of McMurray, Pennsylvania, with completion in September 1971.
TYPICAL SECTIONS OF DAM	See Plate 3.
OUTLETS - PLAN - DETAILS - CONSTRAINTS - DISCHARGE RATINGS	See Plates 8, 9, 10 and 11.

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

ITEM	REMARKS
RAINFALL/RESERVOIR RECORDS	Not recorded.
DESIGN REPORTS	SCS internal memo dated March 6, 1968.
GEOLOGY REPORTS	Detailed geological investigation of dam sites, SCS Form 376, dated December 15, 1967.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	Hydrologic computations, hydrology and hydraulics, geotechnical and structural calculations are available in the SCS files.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	Included in design and geology reports (see Plates 5 and 6 for selected boring logs and Plate 7 for typical subsurface profile).

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

ITEM	REMARKS
POST CONSTRUCTION SURVEYS OF DAM	None reported.
BORROW SOURCES	Described in engineer's report.
MONITORING SYSTEMS	None.
MODIFICATIONS	None reported.
HIGH POOL RECORDS	Not recorded.

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

ITEM	REMARKS
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None reported.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None reported.
MAINTENANCE OPERATION RECORDS	Not maintained.
SPILLWAY PLAN SECTIONS DETAILS	See Plates 2, 7 and 8.
OPERATING EQUIPMENT PLANS AND DETAILS	Available in SCS files.

CHECKLIST
ENGINEERING DATA
HYDROLOGIC AND HYDRAULIC

DRAINAGE AREA CHARACTERISTICS: 0.6 square miles (reclaimed strip mined area)
ELEVATION; TOP NORMAL POOL AND STORAGE CAPACITY: 919.3 (14.8 acre-feet)
ELEVATION; TOP FLOOD CONTROL POOL AND STORAGE CAPACITY: 947.0 (92.9 acre-feet)
ELEVATION; MAXIMUM DESIGN POOL: 957.0
ELEVATION; TOP DAM: 957.0 (without overfill)
SPILLWAY: (Emergency)

- a. Elevation 947.0
- b. Type Trapezoidal open channel (critical depth overflow section)
- c. Width 30 feet (base width perpendicular to flow direction)
- d. Length 250 feet ± (from crest to the end of trapezoidal section)
- e. Location Spillover Adjacent to emergency spillway
- f. Number and Type of Gates None

OUTLET WORKS:

- a. Type 12-inch reservoir drainpipe, 24-inch reinforced concrete outlet conduit
- b. Location At center of embankment
- c. Entrance Inverts Elevation 900 (invert of 12-inch pipe)
- d. Exit Inverts Elevation 889.0 (exit invert of 24-inch pipe)
- e. Emergency Draindown Facilities 12-inch pipe

HYDROMETEOROLOGICAL GAGES:

- a. Type None
- b. Location None
- c. Records None

MAXIMUM NONDAMAGING DISCHARGE: Emergency spillway discharge capacity (4000 cfs ±)

APPENDIX C
PHOTOGRAPHS

LIST OF PHOTOGRAPHS
PA-484 DAM
NDI I.D. NO. PA-489
DECEMBER 5, 1978

PHOTOGRAPH NO.

DESCRIPTION

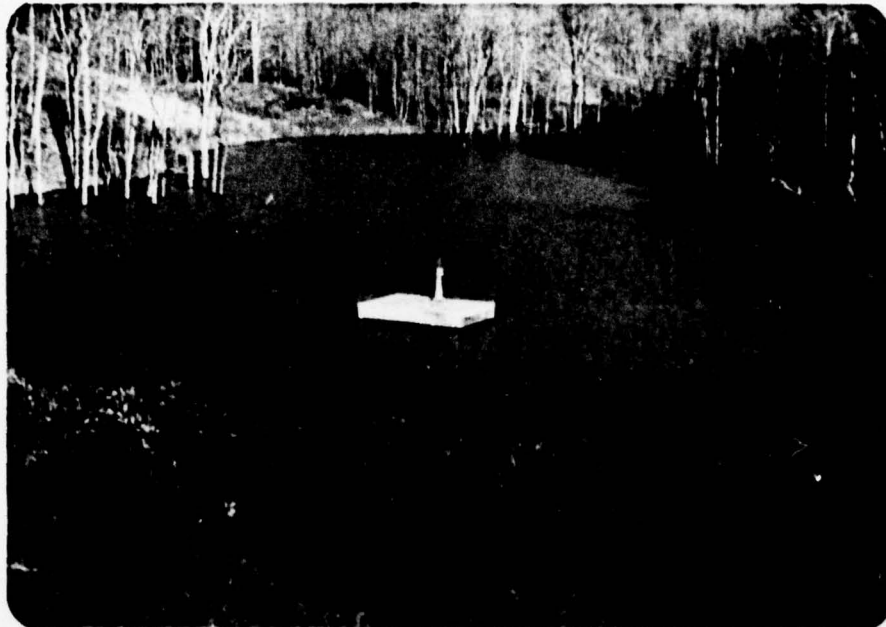
1	Emergency spillway approach channel.
2	Emergency spillway discharge channel.
3	Primary spillway drop inlet structure.
4	Outlet pipe impact basin.
5	Wet area. Tall grass above impact basin indicates the extent of wet area.
6	Stream below dam.



Photograph No. 1
Emergency spillway approach channel.



Photograph No. 2
Emergency spillway discharge channel.



Photograph No. 3
Primary spillway drop inlet structure.



Photograph No. 4
Outlet pipe impact basin.



Photograph No. 5

Wet area. Tall grass above impact basin
indicates the extent of wet area.



Photograph No. 6

Stream below dam.

APPENDIX D
CALCULATIONS

HYDROLOGY AND HYDRAULIC ANALYSIS
DATA BASE

NAME OF DAM: PA-484 (NDI I.D. PA-489)

PROBABLE MAXIMUM PRECIPITATION (PMP) = 24.2 INCHES/24 HOURS⁽¹⁾

STATION	1	2	3	4	5
Station Description	Reservoir	Dam			
Drainage Area (square miles)	0.65	0			
Cumulative Drainage Area (square miles)	0.65	0.65			
Adjustment of PMF for Drainage Area (%) ⁽²⁾					
6 Hours	102	-			
12 Hours	120	-			
24 Hours	130	-			
48 Hours	140	-			
72 Hours	-	-			
Snyder Hydrograph Parameters					
Zone ⁽³⁾	28B	-			
C_p/C_t ⁽⁴⁾	0.57/1.7	-			
L (miles) ⁽⁵⁾	1.5	-			
L_{ca} (miles) ⁽⁵⁾	0.7	-			
$t_p = C_t(L \cdot L_{ca})^{0.3}$ (hours)	1.7	-			
Spillway Data					
Crest Length (ft)	-	30			
Freeboard (ft)	-	10			
Discharge Coefficient	-	3.1			
Exponent	-	1.5			

(1) Hydrometeorological Report 33 (Figure 1), U.S. Army, Corps of Engineers, 1956.

(2) Hydrometeorological Report 33 (Figure 2), U.S. Army, Corps of Engineers, 1956.

(3) Hydrological zone defined by Corps of Engineers, Baltimore District, for determining Snyder's Coefficients (C_p and C_t).

(4) Snyder's Coefficients.

(5) L = Length of longest water course from outlet to basin divide.

L_{ca} = Length of water course from outlet to point opposite the centroid of drainage area.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
A1	A2	A3	B	B1	J	J1	K	K1	M	P	T	W	X	X1	K1	Y	Y1	SS	SE	SS	SD	K	
SNYDER UNIT HYDROGRAPH, FLOOD ROUTING	PA.484 DAM, WASHINGTON COUNTY, MDI-ID. PA489	FOR 30%, 40%, 50%, 60%, 70%, 80%, 90%, AND 100% Pmf	0	10	0	0.50	0.60	0.70	0.80	0.90	1.00	0.57	-0.05	2.0	ROUTING FLOW THROUGH PA.484 DAM MDI-ID. PA489	1	1	190.0	937.0	458.0	3.1	1.5	320.0
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	
0	1	0	10	0	1	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	0.65	120	130	140	1.0	0.05	1.0	0.020		
0	1	0	10	0	1	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	0.65	120	130	140	1.0	0.05	1.0	0.020		
0	1	0	10	0	1	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	0.65	120	130	140	1.0	0.05	1.0	0.020		
0	1	0	10	0	1	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	0.65	120	130	140	1.0	0.05	1.0	0.020		
0	1	0	10	0	1	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	0.65	120	130	140	1.0	0.05	1.0	0.020		
0	1	0	10	0	1	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	0.65	120	130	140	1.0	0.05	1.0	0.020		
0	1	0	10	0	1	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	0.65	120	130	140	1.0	0.05	1.0	0.020		
0	1	0	10	0	1	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	0.65	120	130	140	1.0	0.05	1.0	0.020		
0	1	0	10	0	1	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	0.65	120	130	140	1.0	0.05	1.0	0.020		
0	1	0	10	0	1	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	0.65	120	130	140	1.0	0.05	1.0	0.020		
0	1	0	10	0	1	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	0.65	120	130	140	1.0	0.05	1.0	0.020		
0	1	0	10	0	1	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	0.65	120	130	140	1.0	0.05	1.0	0.020		
0	1	0	10	0	1	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	0.65	120	130	140	1.0	0.05	1.0	0.020		
0	1	0	10	0	1	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	0.65	120	130	140	1.0	0.05	1.0	0.020		
0	1	0	10	0	1	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	0.65	120	130	140	1.0	0.05	1.0	0.020		
0	1	0	10	0	1	0.30	0.40	0.50	0.60														

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
 FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
 AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS							
				RATIO 1	RATIO 2	RATIO 3	RATIO 4	RATIO 5	RATIO 6	RATIO 7	RATIO 8
				.30	.40	.50	.60	.70	.80	.90	1.00
HYDROGRAPH AT	1	.65	1	507.	675.	844.	1013.	1182.	1351.	1520.	1688.
	(	1.68)	(	14.34)	19.12)	23.90)	28.69)	33.47)	38.25)	43.03)	47.81)
ROUTED TO	2	.65	1	460.	655.	826.	995.	1163.	1331.	1499.	1667.
	(	1.68)	(	13.01)	18.55)	23.40)	28.17)	32.92)	37.64)	42.44)	47.20)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1	ELEVATION STORAGE OUTFLOW	INITIAL VALUE 919.30 15. 0.	SPILLWAY CREST 947.00 122. 0.	TOP OF DAM 957.00 184. 2941.				
	MAXIMUM RESERVOIR U.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS	
RATIO OF PMF								
.30	949.90	0.00	140.	460.	0.00	42.00	0.00	
.40	950.67	0.00	145.	655.	0.00	41.67	0.00	
.50	951.29	0.00	148.	826.	0.00	41.50	0.00	
.60	951.85	0.00	152.	995.	0.00	41.50	0.00	
.70	952.39	0.00	155.	1163.	0.00	41.50	0.00	
.80	952.89	0.00	158.	1331.	0.00	41.50	0.00	
.90	953.38	0.00	161.	1499.	0.00	41.50	0.00	
1.00	953.85	0.00	164.	1667.	0.00	41.50	0.00	

OVERTOPPING ANALYSIS SUMMARY

PAGE D4 of 4

APPENDIX E
REGIONAL GEOLOGY

APPENDIX E REGIONAL GEOLOGY

Pennsylvania Dam 484 is located between the Aunt Clara Dome and the Gillespie Dome. The strata strike northeast and dip approximately 70 feet per mile to the northwest. The stratigraphic column consists of members of the Upper Conemaugh Group, with shale, siltstone, and sandstone the primary rock types.

The lowest stratigraphic member of interest is the Pittsburgh red beds, a thick sequence of reddish claystone and shale. Above the red bed material is the Ames Limestone, a thin gray marine limestone which acts as a marker bed. The Ames Limestone may be from 10 to 40 feet below the surface in the vicinity of the dam, is highly jointed, with these joints open or filled with clay. These joints are usually interconnected with a possibility of piping along the fractures. Above the Ames are 22 feet of a green-gray siltstone, 10 feet of calcareous shale, and 3 to 4 feet of a carbonaceous shale, which is equivalent to the Duquesne coal seam. Above the black shale is the Birmingham Shale, approximately 35 feet thick and consisting of a reddish claystone and shale, and then the Morgantown Sandstone. The Morgantown Sandstone is a hard, thick-bedded, gray, medium- to coarse-grained sandstone with high permeability where weathered. Above this formation is a varicolored soft siltstone. The Pittsburgh coal seam occurs approximately 215 feet above the Duquesne coal seam, at approximately Elevation 1150.

The Birmingham Shale is easily eroded and is known to be slide prone in the region. Less than 10 percent of the surrounding area is covered by slide deposits. One small old slide is evident near the west abutment of the dam. Information from the drilling conducted by the SCS indicates that slow sliding may be occurring in the rock strata.

DRAWING 78 57-A19
 NUMBER
 2-6-77
 CHECKED BY
 2-5-79
 APPROVED BY
 ACS
 2-5-79
 DRAWN BY



SCALE
 0 1 2 3 4 5 miles

PA 479, PA 482, PA 484, NEW, OLD
 AND CHERRY VALLEY DAMS
 GEOLOGY MAP

REFERENCE

GREATER PITTSBURGH REGION GEOLOGIC MAP
 COMPILED BY W R WAGNER, J L CRAFT, L HEYMAN
 AND J A HARPER, DATED 1975, SCALE 1:125000

IDAIPIDIANLA

DRAWN BY
2-5-79
CHECKED BY
2-5-79
APPROVED BY
2-5-79
DRAWING 78-7-A22
NUMBER

GROUP FORMATION

DESCRIPTION

Alluvium		Qt	Sand, gravel, clay.
Terrace deposits			Sand, clay, gravel on terraces above present rivers; includes Carmichaels Formation.
DUNKARD	Greene		Cyclic sequences of sandstone, shale, red beds, thin limestones and coals.
	Washington	Pw	Cyclic sequences of sandstone, shale, limestone, and coal; contains Washington coal bed at base.
	Waynesburg		Cyclic sequences of sandstone, shale, limestone and coal; contains Waynesburg coal bed at base.
MONONGAHELA		Pm	Cyclic sequences of shale, limestone, sandstone and coal; contains Pittsburgh coal bed at base.
P: CONEMAUGH	Casselman	Pcc	Cyclic sequence of sandstone, shale, red beds and thin limestone and coal.
	Ames		
	Glenshaw	Pcg	Cyclic sequences of sandstone, shale, red beds and thin limestone and coal; several fossiliferous limestone; Ames limestone bed at top.
ALLEGHENY	Vanport		Cyclic sequences of shale, sandstone, limestone, and coal; contains Brookville coal at base and Upper Freeport coal at top; within group are the commercial Vanport limestone and Kittanning and Clarion coals.
		Pa	

GEOLOGY MAP LEGEND

REFERENCE:

GREATER PITTSBURGH REGION GEOLOGIC MAP
COMPILED BY W.R. WAGNER, J.L. CRAFT, L. HEYMAN
AND J.A. HARPER, DATED 1975, SCALE 1:125 000

10° 11' 12" N 111° 12' 13" W